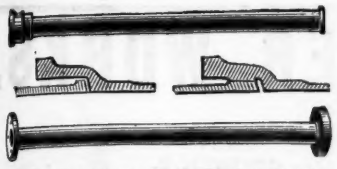
# THE JOURNAL OF GAS LIGHTING
## WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXVI. No. 1702.] LONDON, DECEMBER 24, 1895. [47TH YEAR. PRICE 6d.



GAS AND WATER PIPES
1½ to 12 IN. BORE.



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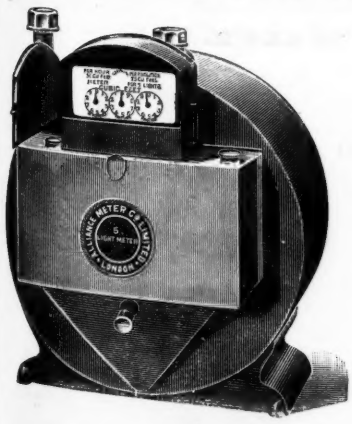

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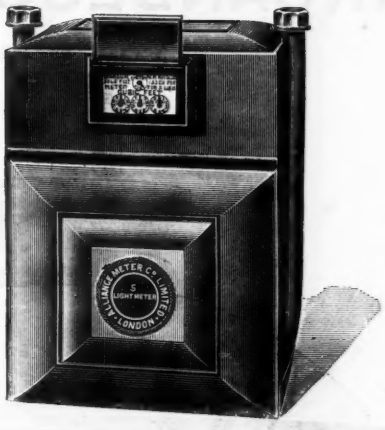

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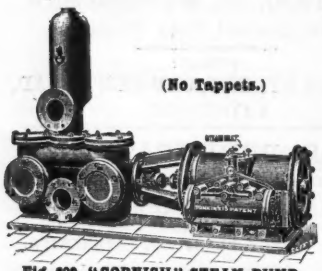

(No Tappets.)

Fig. 600. "CORNISH" STEAM-PUMP FOR WATER.

TRADE MARK.

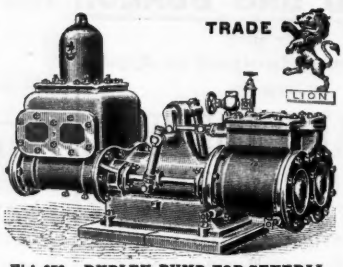


Fig. 670. DUPLEX PUMP FOR GENERAL PURPOSES.

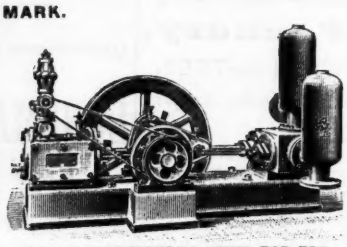

Fig. 685. "RELIABLE" PUMP FOR TAR AND THICK FLUIDS.

Fig. 705. SINGLE RAM PUMP FOR BOILER FEEDING, &c.

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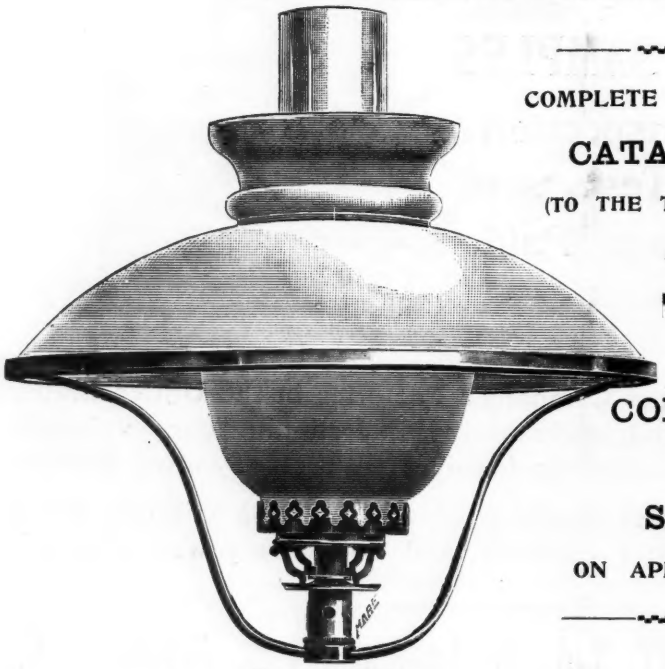

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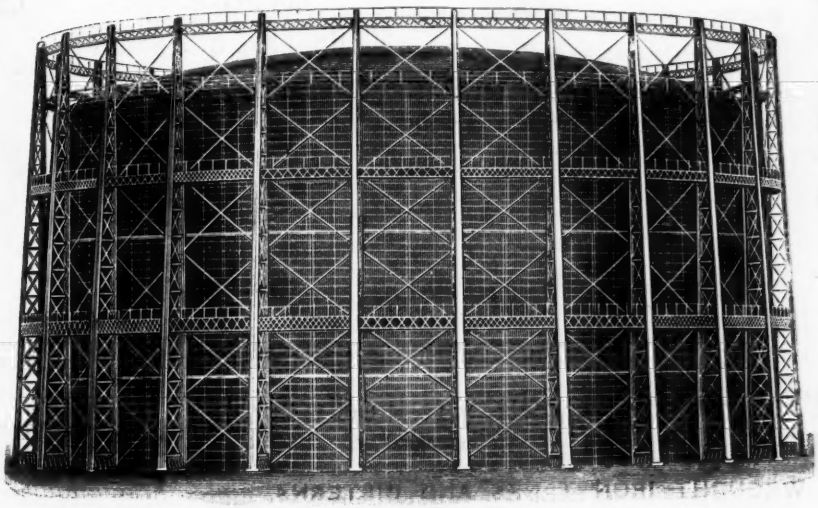

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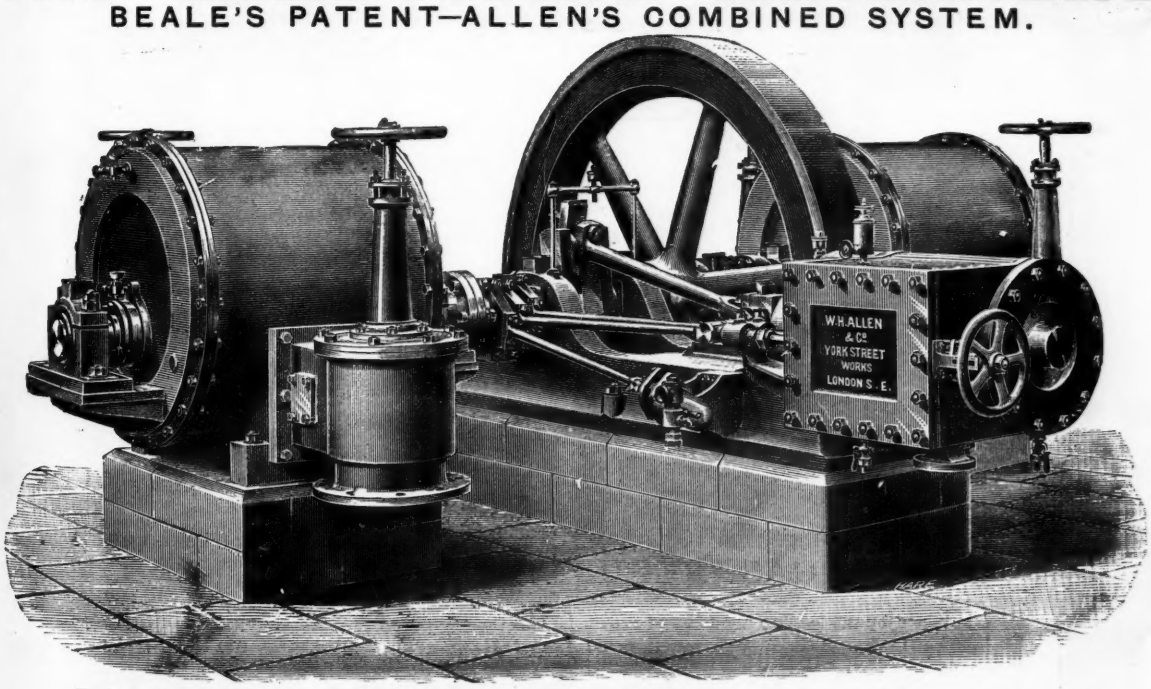


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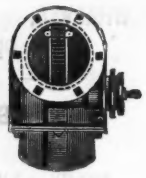

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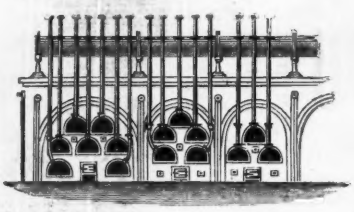

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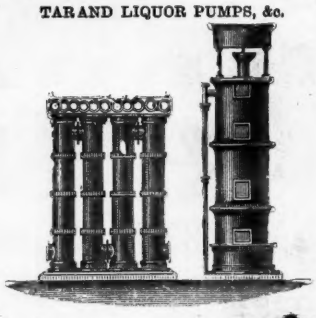

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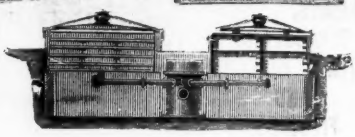

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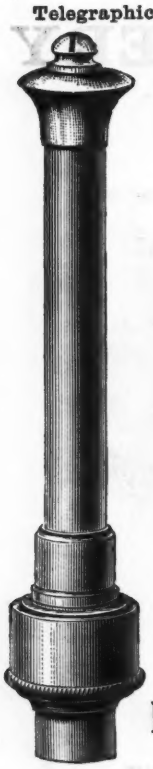

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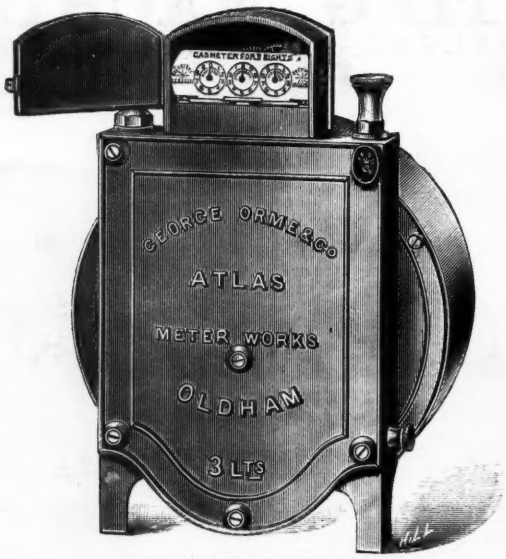
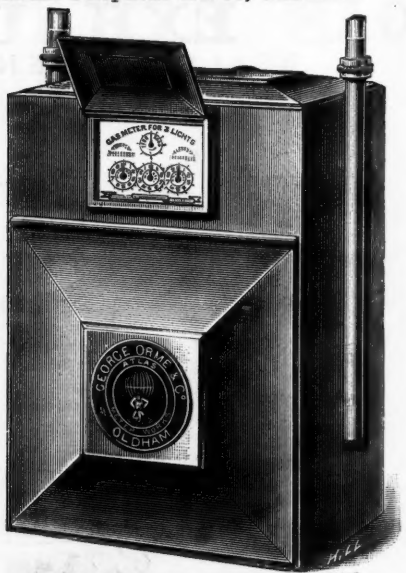



WET GAS-METER IN CAST-IRON CASE.




DRY GAS-METER IN STRONG TIN-PLATE CASE.

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Ordinary Regulator Burner with "Codac" Top on.

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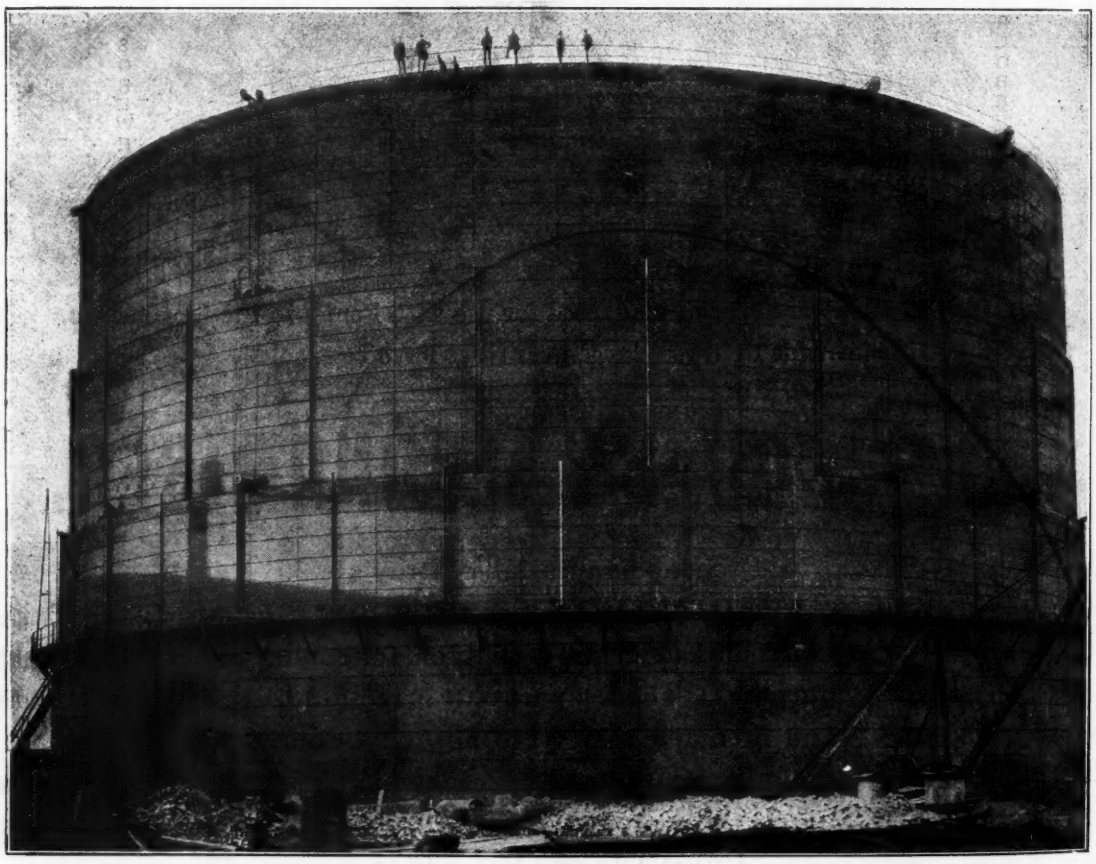

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(From Photograph of Middlesbrough Gasholder). Three Lifts, 30 ft. deep each; Tank, 186 ft. 6 in. diameter, by 31 ft. deep. Capacity 2,250,000 Cubic Feet.

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Middlesbrough (see Illustration).
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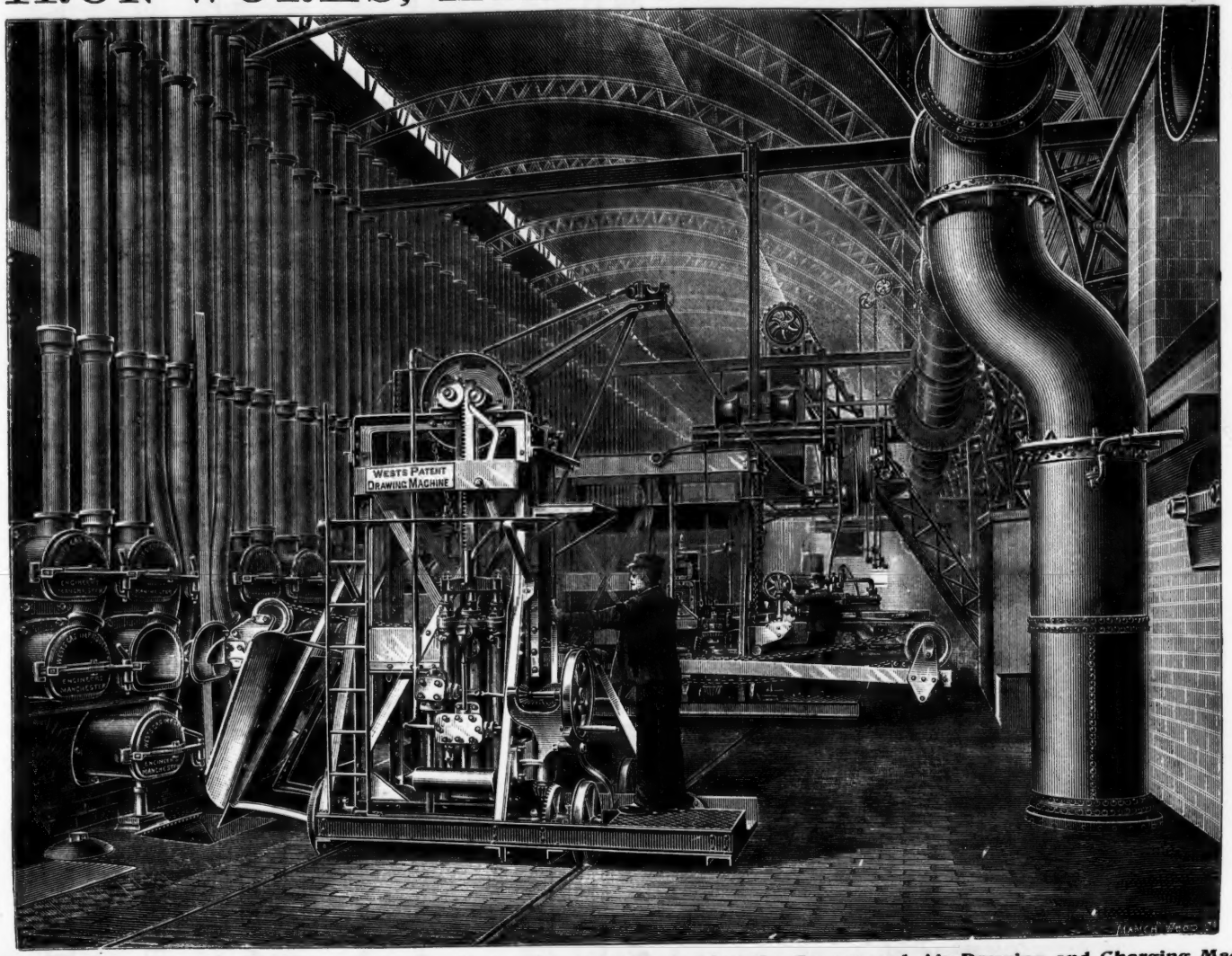


Interior of Retort-House at the Bradford Road Gas-Works, Manchester, showing the Compressed-Air Drawing and Charging Machines.

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*TAR-BURNERS. ROOFS. GIRDERS, &c., &c.*

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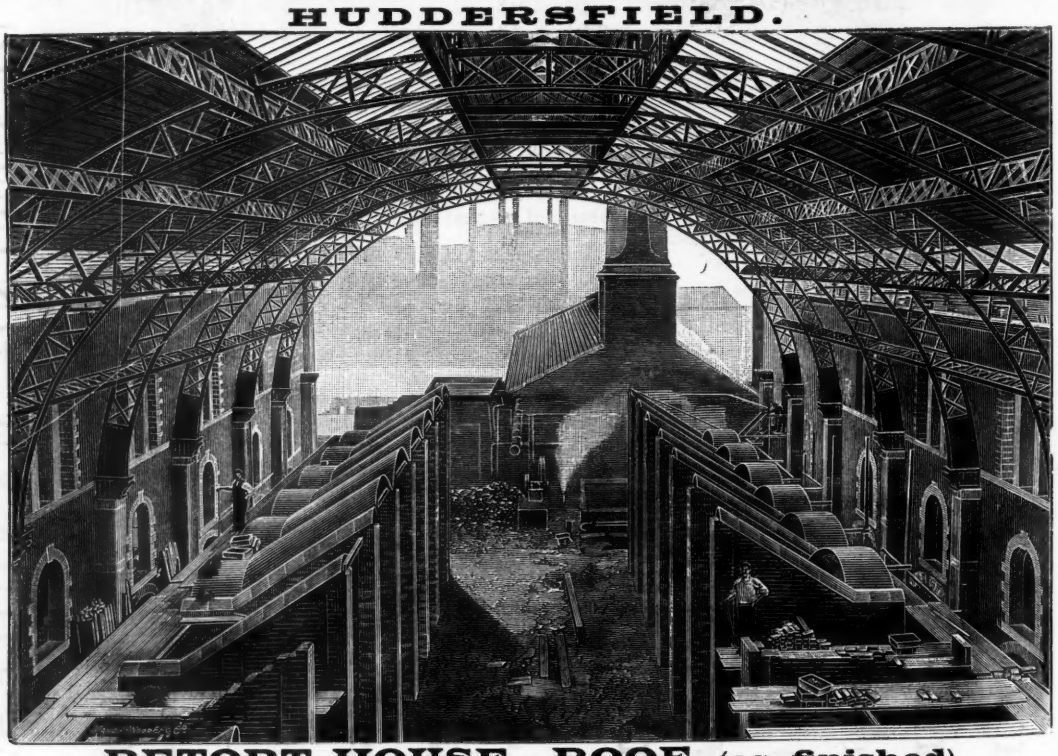

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Span 89 ft. 6 in. by 360 ft. long.

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**Which has now been successfully adapted to the purposes of**

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**THE DIFFICULTIES CAUSED BY VIBRATION HAVING BEEN OVERCOME BY THE USE OF A SPECIAL BURNER, WHICH GIVES HIGHLY SATISFACTORY RESULTS.**

**Two forms of Burners are specially recommended for Street Lighting:—**

**THE "C" BURNER,**
Giving a light of **60** Candles, with a Consumption of **3½** Cubic Feet of Gas an hour.

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Giving a Light of **25** to **30** Candles, with a Consumption of **2¼** Feet of Gas an hour.

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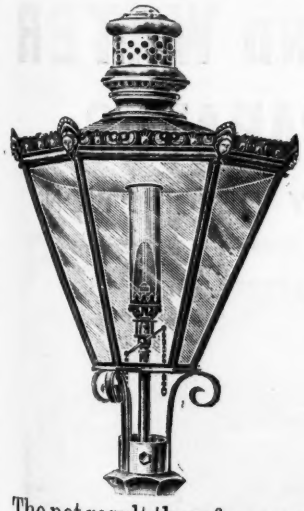
The Lighting Engineer of the Kensington Vestry, in a report dated the 14th of May, 1895, addressed the Works and Sanitary Committee as follows:—



(1) During the months of January, February, and March, 1895, 31 Incandescent Gas-Lamps were in use for an average period of 1167·89 hours.
The estimated quantity of gas that would have been consumed by the 10-feet flat-flame burner was 11,678 cubic feet. The actual quantity of gas used by the Incandescent Gas-Light Company's Burners, as recorded by the meters, was 4415 cubic feet.
After allowing for the extra cost of up-keep, the gain to the Vestry by the use of these burners was £20 3s. 4¾d., and a large increase in the Illumination of the Street.
(2) The illuminating power given by the Incandescent Gas-Burners, consuming 3·78 cubic feet of gas per hour, was found to be equal to 60 candles. That given by the flat-flame burners, consuming 10 cubic feet of gas per hour, was 26 candles.
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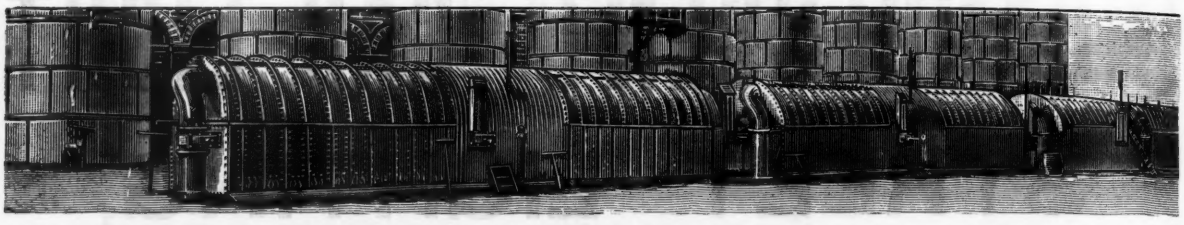
## PATENT "STANDARD" WASHER-SCRUBBER

☛ **504** of these Machines (capable of dealing with **491,150,000** cubic feet of Gas daily) in use and in course of construction, which fact is given as evidence of this apparatus being the Most Efficient of any in the Market for the extraction of Ammonia, Carbonic Acid, and Sulphuretted Hydrogen from Coal Gas.



View of SIX PATENT "STANDARD" WASHER-SCRUBBERS, erected at the Beckton Station of The Gaslight and Coke Company (the Engines driving same being under Galvanized Iron Covers). This Company have 30 of these Machines in use. They are also in operation at a great number of Gas and other Works in this Country and Abroad.

## MARSHALL'S PATENT BATTERY CONDENSER & SCRUBBER.

This apparatus being made in sections, the capacity can be easily and cheaply made proportionate to increased make of Gas. Other advantages are: Large and effective cooling area on small ground space, slow speed, no repairs required, high strength liquor obtained, &c. Six of these Condensers now in course of construction and erection.

### MARSHALL'S PATENT TAR-EXTRACTOR.

Extracts practically all the Tar without choking up, and gives minimum back-pressure.

**These Machines are in use at Ilford, Antwerp, Copenhagen, &c.**

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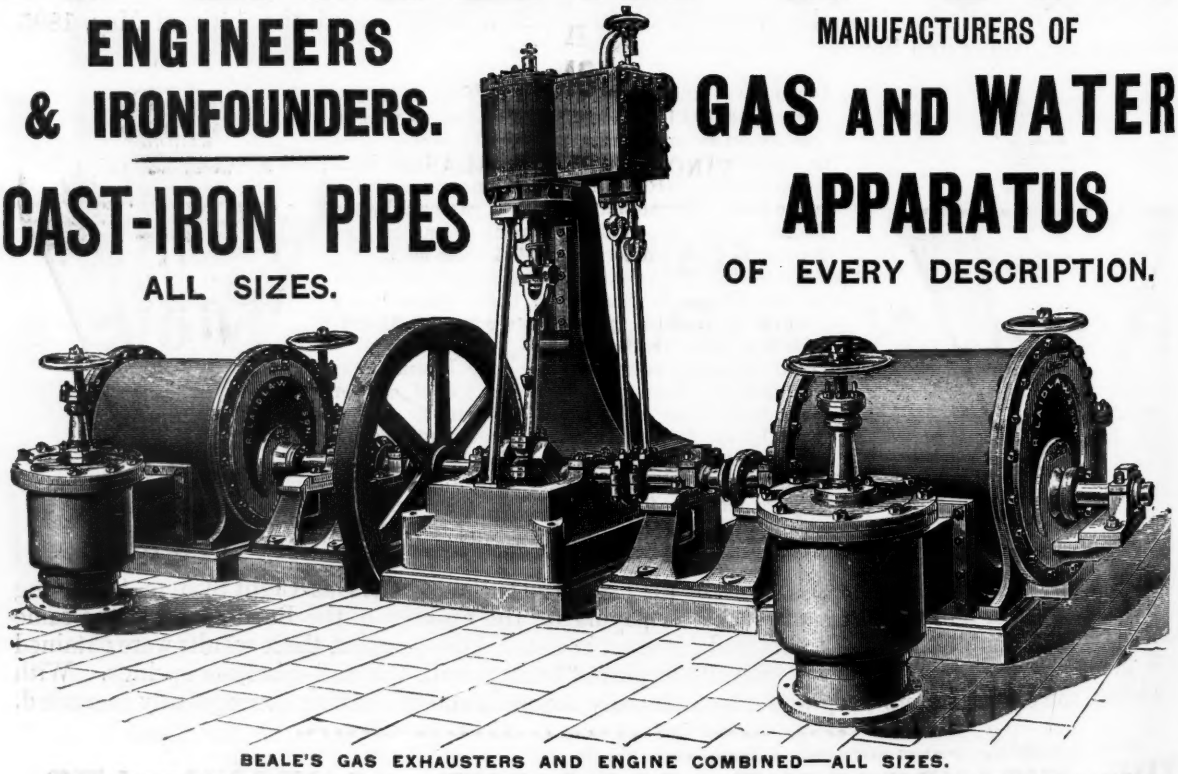

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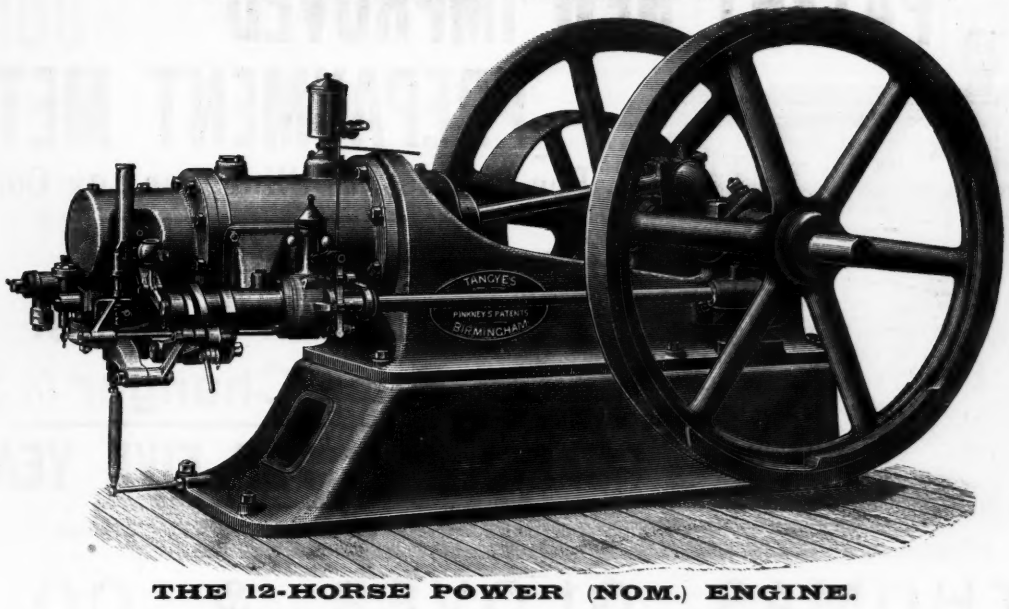


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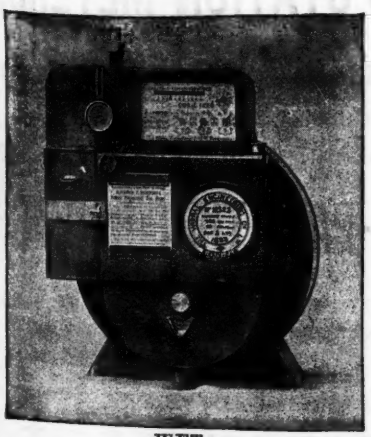

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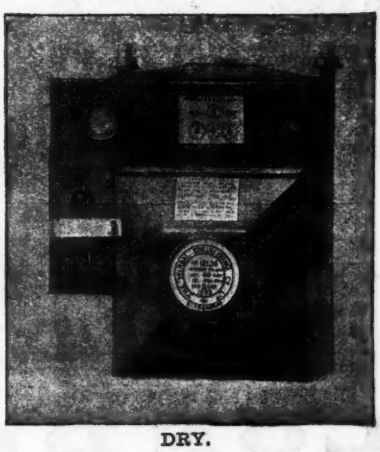

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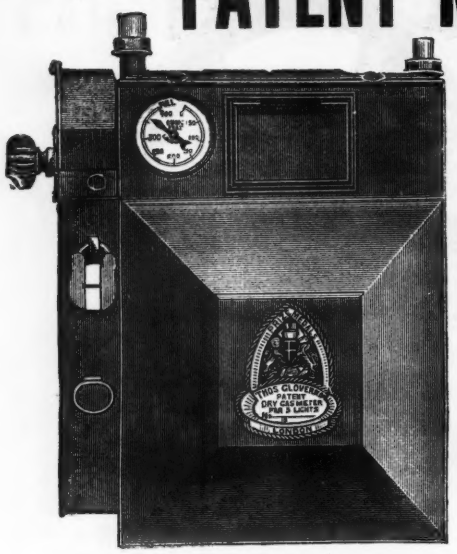

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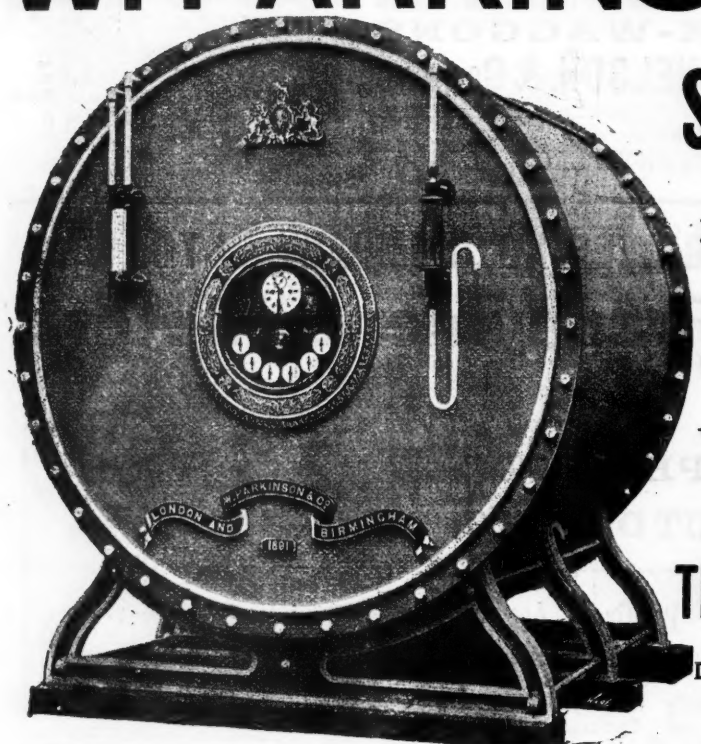


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### THE "JOURNAL" OFFICES.

**The rebuilding of the "Journal" Offices having been completed, the Editorial and Publishing Departments have been transferred from Temple Chambers and No. 1, Gough Square, to No. 11, BOLT COURT, FLEET STREET, E.C. Correspondents and friends calling will kindly note that this will in future be the ONLY ADDRESS for "Journal" business.**

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## EDITORIAL NOTES.

### The South Metropolitan Bill.

AMONG the firstlings of the new crop of Gas Bills to come to hand is that of the South Metropolitan Gas Company, which declares the expediency of effecting the following alterations in the statutory settlement of the undertaking. The authorized capital with a standard rate of dividend of 10 per cent. is to be converted into a capital of one and the same class, but of two-and-a-half times the amount, having the uniform standard rate of dividend of 4 per cent. The authorized amount of debenture stock is to be converted into a substituted stock bearing less than 5 per cent.—the present rate—and not less than 3 per cent. interest. The sliding-scale is to be corrected to a rise or fall of one shilling per cent. of the new stock for the half year for one penny per 1000 cubic feet of gas. A scheme may be prepared by the Directors, "as and when they "deem expedient," for the purpose of enabling employees holding stock under the profit-sharing arrangement to the nominal amount of £40,000 "to elect one or more of their "number, but not exceeding three, to take part with the "Directors in the management of the Company." Any such scheme is to be submitted to a special general meeting of the Company, which may adopt it either with or without alteration, and also to the Board of Trade, under the same condition. The scheme, when it is approved, is to be published in the *London Gazette;* and it is then to remain in force for three years and no longer. If during this period the amount of the investment of the employees in the stock of the Company falls short of the nominal sum of £40,000, the scheme is to terminate. On the cesser of such scheme by efflux of time, a new one may be prepared and carried into effect in like manner; and so on from time to time. The qualification of an Employee Director is to be fixed by the scheme, subject to the limitations of his having been not less than seven years in the constant employ of the Company, and holding for a year previous to his election £80 nominal stock. He is to be disqualified by ceasing to be in the Company's service or to hold the requisite amount of stock. The fees of such Director are to be fixed by the scheme, and will bear some proportion to the amount of the qualification—not being less than his ordinary day's pay nor more than four times that amount. He is to perform his ordinary duty except on Board-day. A schedule to the Bill makes regulations for the transfer and paying off of profit-sharers' stock. According to the capital clauses of the Bill, the existing stocks of the Company will become £5,400,000 of fully paid-up ordinary 4 per cent. stock; and the unissued proportion of the existing "C" stock will be replaced by the equivalent value of the same stock, so as not to increase the capital powers of the Company. All this stock is to be issued in multiples of five pounds. When any additional stock is to be issued, the Company, before offering it to the holders of other stock or for sale by auction or tender, may (with the approval of the Board of Trade) offer it to the consumers and employees of the Company at not less than the average market price for the previous month. Stock remaining unsold after having been offered for sale by auction or tender, may be offered at the reserve price to stockholders, consumers, and employees. The whole of the purchase-money for stock is to be paid within a month. We have nothing to offer at present by way of comment upon the proposals of the Bill, beyond drawing attention to the way in which the capital and sliding-scale are to be modified, and expressing satisfaction that our hint of the 26th ult., in regard to the rate of debenture interest, has been acted upon.

### Two Provincial Gas Bills—The Rate of Dividend for Consolidated Gas Capital.

THE Bill which the Cheltenham Gaslight and Coke Company are promoting in Parliament is the first they have needed for some twenty-four years; their last Act being dated 1872. They are at the end of their stock-issuing resources; but they have only £17,500 of debenture stock issued, and do not owe anything on mortgage. The authorized capital consists of three classes of stock—the £25,000 original 10 per cent. stock of 1856, the £50,000 of 7½ per cent. stock then sanctioned, and £80,000 of new "A" 7 per cent. stock of 1872. Thus the proportion of

debenture stock to this £155,000 of ordinary capital is extremely modest; and one of the first questions that will be addressed to the Company's witnesses when they get to Westminster will in all probability be as to the why and the wherefore thereof. The Bill proposes to consolidate all the classes of stock into an equivalent amount of 5 per cent. stock, and to take powers to raise £100,000 of additional capital of the same class; borrowing powers to the old proportion of one-fourth of the stock capital being asked for. It is intended to enlarge the works, acquire more land, and make a railway siding into the gas manufacturing station from the Midland Railway. Practically, this is the Bill; and it expresses all the Directors hold to be necessary in order to meet future requirements. At the same time, the Cheltenham Corporation are promoting a Bill to enable the ratepayers to obtain possession of the undertaking—a step which we have ventured to characterize as superfluous. The only pertinent questions concerning the Cheltenham gas supply could be fully gone into upon the Company's Bill. When the position of the undertaking comes to be explained to the Committee, we have not the smallest doubt that the property will be proved to be a very fine one indeed, and such as any municipality might be glad and proud to possess. The works are an embodiment of the personality of Mr. R. O. Paterson, who is acknowledged to be one of the most accomplished and careful of gas engineers and managers in the kingdom. What the Committee will think of the actual and proposed capital arrangements of the Company may be shrewdly suspected. Such modern inventions as the sliding-scale and auction clauses have been warded off from Cheltenham to this day; and even now the Directors will only admit so much of these new-fangled administrative arrangements as they cannot keep out. It would be a correct description of the Company's condition to say that, with the newest and best of works and plant, they have the oldest scheme of finance to be found anywhere. This state of things is "racy of the soil;" for, without a suspicion of old-worldliness, nothing belonging to Cheltenham would be in keeping with the town.

Leamington is like Cheltenham in several respects; and this session the two "inland watering-places," as the geography books used to classify these towns, are to rejoice in the prosecution of gas purchase schemes of identical character. It will be interesting to follow the fortunes of the would-be bargainers in both places. Newcastle-upon-Tyne and Gateshead are also to engage the attention of Parliament next year in respect of gas supply. The Company—one of the most successful undertakings of the kingdom—want more money and larger works. They were last in Parliament in 1879, when their stock capital was settled at £750,000; and, in addition, they have raised on mortgage and by debenture stock £175,000. The Bill proposes to create additional 5 per cent. preference capital to the amount of £500,000, with power to borrow £150,000. It is a natural reflection upon these two Gas Bills—the Cheltenham and the Newcastle-upon-Tyne—that there is a perplexing want of agreement among gas directors as to what are the most desirable financial conditions to be sought for at any particular juncture. The difference of opinion is further accented by reference to the proposals of the South Metropolitan Board. Supposing all three of these Bills to go before the same Committee, how puzzled the good gentlemen would be to reconcile the divergent proposals for attaining ostensibly the same end. South London, Cheltenham, and Newcastle all presumably want the same treatment in the matter of gas supply. They want the best service that can be had at the lowest price; and the interest of capital is in all cases the same. Why, then, must the Committee be persuaded—possibly by one and the same Counsel—that it is expedient for one locality to be provided with 4 per cent. ordinary consolidated stock, another with 5 per cent. ordinary consolidated stock, and yet another with 5 per cent. preference stock? Of course, there is no concerted action among the promoters of Gas Bills relating to different undertakings. We believe that if other Gas Companies had tried last session, like the South Metropolitan, to consolidate their capitals upon a 5 per cent. basis, and had failed, they would go like them for a 4 per cent. stock next time. It seems extravagant to say so; but, really, if first-class gas stocks go on rising in value as they have done of late, it will not long be 4 per cent. that will serve to bring their equivalent substitutes down to a little over par value. This is, of course, the principle of the whole movement. There is no special validity in 5 per cent., 4 per cent., or any other standard rate of dividend that might be chosen for a consolidated gas stock, beyond its approximation to the actual return on the investment. If a purchaser of such stock can only get it at such a price as represents a return of 3½ or 3 per cent. upon the purchase-money, then this should naturally be its denomination. Of course, these steps must be taken carefully, and only so far as may be warranted by the facts and by the likelihood of their continuance. For the present, 4 per cent. is quite low enough for an ordinary gas stock; but this is as reasonable and proper a rate now as were 10, 7½, and 7 per cent. in past times.

After all, alterating the standard rate of dividend to suit the financial circumstances of the day is only acting in the spirit of the pioneer legislators on gas supply in this country. This proceeding is open to the criticism that it fixes the "unearned increment" of value for all future time. But this is only true in name, not in fact. It is impossible to make people pay more for a thing than they think it is worth, whatever designation it may bear. But it is to be hoped that, whatever course may in future be followed in classifying gas capital, the divergence of the real from the nominal value will never be allowed to get so far as it has done. Indeed, this would be impossible. There are prudent friends of the gas industry who hold the opinion that Gas Companies' capital already stands at far too high a price in the market; and this is very likely true. These things cannot be helped, however. Gas stocks are very high-priced just now; but there is no inflation in the values. What they are, that they are likely to remain under the ordinary vicissitudes of the gas industry; and this is the justification of the South Metropolitan Directors for adopting the new standard rate of dividend they have selected. It is nearer the truth than any other equally convenient figure; and they do not want any more premium capital.

### The Inconvenient Conveniences of Modern Civilization.

A HUMOROUS, yet withal pathetic, complaint has been uttered in a letter to *The Times* by Mr. Harry Furniss, respecting the irritating inconvenience caused by so-called "modern conveniences" which do not always act satisfactorily. His grievance is against telephones, the working of which he characterizes as a farce; the electric light, which he has known to go out "four times in one "week;" and the District Messenger system, which frequently breaks down. He sums up the whole case against these "modern improvements" by declaring that "the "electric light kills our sight; the telephone destroys our "temper; the District Messenger call ruins our dinner; "and, conjointly, they waste our time and deplete our "purses." There is in all this a reminiscence of the "vanity of vanities" complaint of a much more distinguished pessimist; but—"happy thought!" as another humorist might say—there is an obvious remedy for these disappointing modern improvements, which is to do without them. After all, people are not bound to plague themselves with telephones, phonographs, electric light, or district messengers. Most imaginative writers who attempt to forecast the future, are very prone to indulge in visions of a state of civilization when improved mankind will only have to "press a button," and something or somebody else will "do the rest." It is at least open to question whether, if this dream were actually realized, the improved man would be the better or happier for it. In the meantime, it is certain that all attempts to make social existence easier for the individual, by offering to do for him by mechanical appliances or by organized services offices which he previously lacked or did for himself, cause more annoyance when they fail than pleasure when they act in the manner and to the end designed. This effect belongs to their very nature. There is nothing in such arrangements or appliances capable of giving a sense of pleasure to the user. They can but promise to save time, spare exertion, and generally absolve the individual from being compelled to do things for himself. In nine cases out of ten, he does not know the want of them until he is provided with, and has formed the habit of relying upon them; and then, if he is suddenly and unexpectedly deprived of them, he rages against the whole scheme of such things, like Mr. Furniss.

It is impossible to ensure that modern improvements shall not occasionally break down; and when this happens,

the resultant inconvenience is in geometric ratio to the satisfaction produced by their proper operation. At the present season, who regards the prospect of a repetition of last winter's intense frost with greater equanimity—the householder who has enjoyed for months the convenience of a complete system of hot-water circulation, or he who never had a circulating boiler in his kitchen range? The gas consumer who has known what it is to have a wet meter frozen hard and fast on the very day chosen by his family for celebrating the "festive season" in the traditional manner, is not to be comforted by the reflection that he has had no such trouble with his gas for a whole twelvemonth. It is doubtless handy to be able to turn on an electric light at will, as on entering a bedroom after dark. But when the current refuses to attend the summons, the disgusted victim of modern improvement is apt to reflect bitterly upon the time when he carried a candlestick upstairs as a matter of course. The wise man is he who can with sincerity, like the Greek philosopher, look upon many things in the market-place without feeling need of them. Wiser, perhaps, is he who recognizes the limitations of his servants, and remains master of himself even though accustomed facilities fail.

### Income-Tax Payable by Foreign Traders.

JUDGMENT was given in the House of Lords last week in an appeal case of particular interest for English companies and individuals trading abroad. The action was between the San Paulo (Brazilian) Railway Company, Limited, who have a registered office in Gresham House, London, and a Surveyor of Taxes; and it raised the question of the liability of the Company to pay income-tax in England upon the full amount of their profits and gains, wherever made. The Company in question have constructed and own a railway in Brazil, which is worked at a profit. The supreme control and direction of the railway are from the London head-quarters, where the meetings of Directors and shareholders are held. But a superintendent residing in Brazil manages the line, and sends the net gains home for distribution as dividends. The Directors contended that the liability to pay income-tax in England was only in respect of the full amount of the actual sum received in the United Kingdom upon an average of three years, which was found, as a fact, to be £295,070 and no more. The Commissioners of Income-Tax were of opinion that the Company are chargeable under the first case of Schedule D; and they confirmed the assessment that had been made by the Surveyor of Taxes in this classification upon the full profit of £370,122. A special case was stated for the consideration of a Divisional Court, with the result that the Commissioners were held to be wrong. Then the Court of Appeal in turn set aside this decision; and from this judgment the Railway Company appealed to the House of Lords. The final result is, that the Company are found to have been rightly assessed; so that their appeal was dismissed with costs. This decision goes a long way to strengthen and define the law of income-tax assessment; and it will be welcome to the general body of taxpayers of the United Kingdom, whatever may be felt by the traders affected by it. In delivering judgment, the Lord Chancellor observed that all cases of the same kind that have been dealt with by the House of Lords have gone to establish the proposition that, where trade is wholly or partially carried on in this country, the trader is liable to pay income-tax on his profits. In the case in point, the fact of the Railway Company having a "residence" in England is sufficient evidence that their "trade," such as it is, is carried on here; and that, consequently, they must pay on all their profits. In another column we give the observations of the Lord Chancellor, Lord Watson, and Lord Davey in full. These are of great weight, as settling the question of where a trade is carried on, which is held to be wherever the supreme control is exercised. It does not matter what the operations may consist of, or where they are conducted. It is the head of the business that makes the profits; and, consequently, where the head is, there the profits are made. As Lord Watson remarked, the case did not involve any controversy upon the construction of the Income-Tax Acts, but turned upon the single issue of fact, which it certainly appears to us could not be rightly determined in any other way than that taken by their legal Lordships. It remains to be seen what difference this decision will make in future income-tax returns.

## WATER AND SANITARY AFFAIRS.

IT would seem at the present time that the London County Council scarcely know what to do with the water question. In the middle of October, the Parliamentary Committee recommended that the Council should invite Her Majesty's Government either to deal with the question themselves, or to appoint a Royal Commission for the purpose. Mr. Stuart moved, as an amendment, that the Purchase Bills should be proceeded with. This proposal was rejected; but a week later an amendment was duly adopted, calling upon the Parliamentary Committee to report to the Council the lines upon which they would advise that the Government should be asked to legislate. In response to this demand, the Committee drew up a long report, which was finally dealt with last Tuesday. As we anticipated, the chief recommendations contained in this report were rejected. In fact, the pith and marrow of the report were thrown out. In preference, Mr. M'Kinnon Wood's amendment was adopted, by which the Government are to be asked whether they will promote or assist legislation dealing with the Metropolitan Water Supply, on certain specified lines. Mr. Wood's amendment was not remarkable for brevity; and the Earl of Onslow not inaptly described it as a "lengthy conundrum." The policy to which the Council are now committed is that of asking that the entire control of the water supply within the area of the County of London "shall be in the "hands of the London consumers," who are to be "directly "represented by the County Council in conjunction with "the City Corporation." This is admirably devised as a bait to catch alike the consumers and the ruling power of the City, though as we proceed farther, it will be seen to what an impracticable issue the scheme is conducted. This "entire control" of the water supply—which really means its possession—is to be bounded by the limits of the Administrative County. Beyond those limits, as within, the control of the supply is to be in the hands of the consumers, represented, in the outer areas by the Local Authorities. No doubt, it is expected that the consumers in these regions will be very much pleased. But, on the whole, we can hardly think that the Council are serious in proposing such a polyglot scheme. There is to be an excision—a lopping off—of some hundreds of square miles of territory, now subject to the parliamentary powers of the London Water Companies; and there is to be a dissection of the outer area with a number of independent divisions. As remarked by Lord Onslow, instead of eight Water Companies, there will be sixty or seventy different bodies. That is to say, such would be the case; but the chance of ever seeing it is utterly remote.

How does it come to pass that the County Council see fit to adopt such a miserable scheme? All the advantages to be expected from consolidation and unity are thus to be sacrificed. Even if the outer areas were to be aggregated under one authority—or say, two or three—there would be no coherence in the arrangement. The Parliamentary Committee, representing the views of the Moderate party, recommended that there should be one Water Authority for the entire area comprehended in the report of the Royal Commission. Nothing more facile can be said to offer itself; and if the Council were to adopt it, such a proposal would commend itself to the approval of Lord Salisbury and Sir Matthew Ridley. Mr. Wood contends that his way of dealing with the question is practically carrying out the recommendations of the Select Committee presided over by the present Home Secretary in 1891. This is only partially true, for the Committee recommended that there should be a purchase in the first instance of the entire undertakings of the eight Water Companies; while any transfer of works connected with the outside areas to the local authorities was to be a matter of negotiation some time later on. This did not necessarily involve the surrender of all the outer areas, but simply such as it was found might be advantageously dealt with in that manner. It is curious that the Progressives were willing, in the recent debate, to take a leaf out of the Moderates' book, and refused to forego the second and third recommendations of the Parliamentary Committee, by one of which it was provided that, pending the constitution of the Water Authority, the County Council should authorize the Parliamentary Committee (for which the Water Committee was finally substituted) to initiate

negotiations with the Companies for the purchase of their undertakings. This throws us back into the past; and we may predict that the result will be as before, unless the unreasonable and fatal conditions laid down by the Council on the former occasion are now abandoned.

The amendment adopted provides that the purchase price shall not be assessed under the provisions of the Lands Clauses Consolidation Act, but "shall be based "upon the fair and reasonable value" of the undertakings. That is to say, there is to be no allowance for compulsory purchase; and the property is to be parted with at a sacrifice. The judicious proposals of the Moderate party are denounced by the Progressives as "a great and intentional "betrayal' of Metropolitan interests. Mr. Wood is candid enough to say that he would rather leave the Water Companies as they are, with the Local Government Board and the Council "looking after them," than see created a great Trust "which would never represent the "true interests of London." No doubt, the Council have a horror of being overshadowed. Such, at least, is the sentiment which governs the Progressives. They cannot leave the water question alone, though it is fast travelling beyond them. Lord Onslow has reminded them that the Water Companies are "themselves bringing measures "into Parliament." If these measures are carried, there must be an end to the Welsh scheme of supply; and the Council will find themselves left where Mr. Wood has portrayed them—joined with the Local Government Board in "looking after" the Companies. Lord Onslow is not desirous for the question to remain where it is. He agrees with an application to the Government; and this appears to be the last hope of the Council. But his Lordship urges that the Government should be approached with something "likely to meet with success." The Council gained nothing but "a bare and cold acknowledg-"ment" of the letter in which they asked Lord Salisbury to undertake the problem of unification. Lord Onslow, in view of this rebuff, asks whether the Council are "going to "continue to plough the sand." It would seem so.

These are troublous times for the Water Companies; but perhaps it is not often that a Company which has been endowed with parliamentary powers meets with such sad experiences as have fallen to the lot of the South Kent Water-Works Company. The proceedings in the Chancery Division which were reported in the last issue of the JOURNAL are not without an element of the ludicrous. The Company, it seems, was incorporated in 1889; but, according to the plaintiffs' Counsel, the only customer up to July, 1895, was the South-Eastern Railway Company, who paid, it was said, £4 per annum for water supplied to their station at Paddock Wood. It cannot be described as a colossal income; and there is very probably no local authority, howsoever eager to command the water supply and pocket its profits, that would seek to wrest the undertaking from its present proprietors. However, the South-Eastern Company are no longer the only customer of the South Kent Water-Works Company; and the Manager of the latter body, without disputing the poor quality of past results, anticipates better things in the near future. Meantime, certain creditors of the Company want their money, and cannot tell where to find it. An execution lodged at the London office produced only the discouraging return of *nulla bona;* and what the Sheriff found at the works was unsaleable. Nevertheless, the Company may presently emerge from all their embarrassments; and Mr. Justice Vaughan Williams has counselled the creditors who sought to obtain a winding-up order to exercise a little more patience. The awkward thing is that the Company have no borrowing powers; and to raise additional share capital will necessarily prove to be a somewhat difficult financial feat in the circumstances above mentioned. However, the petition is to stand over for a time.

**The Managership of the Lea Bridge Gas Company.**—Mr. F. W. Cross, of Wellington (Salop), has obtained the appointment of Engineer and Manager of the Lea Bridge District Gas Company, rendered vacant by the death of Mr. W. Thorman. After completing his articles with Messrs. Willey and Co., of Exeter, Mr. Cross was appointed assistant to Mr. T. Canning, Assoc.M.Inst.C.E., of Newport (Mon.). Subsequently he was for several years in Hong Kong, as Engineer and Manager of the works of the Hong Kong and China Gas Company; and he entered the service of the Wellington Gas Company some time after his return to England.

# ESSAYS, COMMENTARIES, AND REVIEWS.

## GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1310.)

IT is a long time since the Stock Exchange has received such an electric shock as that which was administered to it last week by President Cleveland's Message. Matters were proceeding quietly and cheerfully, when the "bolt from the blue" fell upon the markets. The effect produced is perhaps not quite that which the author expected. It is not so much the fear of war as financial distrust of the United States. The American market went all to pieces, and dragged others down in its fall. But the boomerang recoiled upon the thrower; and, bad as things were here, the havoc it wrought in Wall Street was ten times worse. What the end of it may be, there is no telling; but it will be a very long time before European gold flows westward. Prices, of course, are bad all round; the Foreign Market being the hardest hit next to "Yanks." The Money Market profited by the occasion, and did better business than it has seen for months. The Gas Market pursued the "even tenor of its way" undisturbed by the troubles of its big neighbours. Business was quieter, showing an unmistakable disposition to slacken off for Christmas. But the market was very strong; and advances in quotation are many in number, and considerable in extent. In Gaslights the "A" opened gaily, with a mark of 297; and, though not particularly active, it pushed steadily on till it fetched 299½ on Friday. Business in the secured issues was almost at a standstill; but several of them advanced their prices. South Metropolitans were more active, and seemed at first as if they were going to rise in price, but later in the week they relaxed their efforts. Commercials again were very strong. The old and new stocks each gained a point, while the debenture made a large advance, and now figures among those securities which return less than 3 per cent. for money. The Suburban and Provincial class is full of interest. Brentfords continue steadily to advance. Bromley new does the same; a considerable number of shares having changed hands outside the market at high figures, in addition to the new issue being well taken up. Tottenham and Edmonton, which rarely come into the market, realized a very high price at the Mart, sufficient perhaps to justify even a higher quotation than we accord them this week. The Continentals did not do well; Imperial being further depressed, and Union losing a point. None of the rest offer much for remark; but San Paulo had a slight fall. Business in the Water Companies was very slack. But the general tendency was fair on the whole; and Southwark had a small advance *ex div.*

The daily operations were: The Gas Market was extremely quiet on the opening day; but the general disposition was strong, and several quotations improved. In Gaslights, the "A" rose 1; "J," 5; and "K," 1. Commercial debenture was 2¼ better *ex div.* There was more business doing on Tuesday, especially in South Metropolitans, which were firm. Commercial debenture rose 4½ more; and Brentford old, 1. Wednesday was fairly active; and prices mostly were good. Brentford new rose 2½; and Commercial old and new, 1 each; but Continental Union dropped 1. Transactions fell away considerably on Thursday. Gaslight "A" improved 1; and Bromley new, ½; but Imperial Continental receded 2; and San Paulo, ½. Friday was a more active day, and prices were good; but Continental Union fell 2. Saturday was unimportant; and quotations did not move.

## ELECTRIC LIGHTING MEMORANDA.

**Major S. Flood Page on the Fire Risks of Electric Lighting—The Fire Risks of Various Lighting Systems—The Risk of Increased Voltage.**

THE redoubtable Major S. Flood Page has come to the fore again in the columns of *The Times* with one of his cogent letters; this time with the double object of proving the safety of electric lighting by statistics of fires occurring during the last three years in the Metropolitan area, and of cautioning the public against the proposed increase of voltage in low-pressure supplies. He has to acknowledge the awkward fact of two electric lighting central stations and one electric engineering works having recently been burnt down, which has very naturally "created an unfavourable impression in the minds of fire managers in regard to this class of risk;" but he protests against any reflection of this impression on the minds of householders who have electric light upon their premises. Figures obtained from Captain Sexton Simonds, the Chief Officer of the Metropolitan Fire Brigade, are quoted to show that during the last three years there have been in London 2714 fires caused by the means of lighting, of which 576 were caused by candles, 833 by gas, 1305 by lamps, and only 9 by electricity. The writer points to these figures as sufficient to "allay any feeling of anxiety in the minds of users of electric light as to there being any practical danger from electric light properly installed in their houses. They will," he thinks, "serve to enforce the argument that by far the safest artificial light ever introduced into common use

is the electric light." We do not contest this conclusion; though, to complete the demonstration, it would be necessary to show the ratios which the numbers of houses lighted by the different methods bear to those of the fires reported. But the figures are capable of more interpretations than the single one upon which the writer insists. They show even more strikingly that considerations of safety from fire alone do not weigh much in the public mind. People who use candles continue to do so, oblivious of the fact that they cause about 200 fires every year in the Metropolitan fire area alone. And what is to be said about oil-lamps, which are responsible every year for more fires than all other means of lighting put together? Only that people do not think twice about such a consideration, notwithstanding the knowledge they must have that the mineral oil-lamp is the most dangerous means of lighting that can be taken into a house.

In the year 1892, oil-lamps caused 373 fires; next year the number rose to 456; and last year it rose again to 476. And this despite the fact that these years witnessed a great expansion of both gas and electric lighting. Fires traceable to gas, by the way, were 265 in 1892; the following year they numbered 284; and last year they were exactly the same. So that, though so much more is burnt for various purposes, the fire risk from gas is becoming proportionately less; whereas the danger from oil-lamps grows graver year after year. It should be borne in mind, moreover, when these figures are considered, that the Metropolitan fire area is much smaller than the Metropolitan police area. If the whole of Greater London were embraced in these returns, the case against oil-lamps would be much blacker. So much for the statistics of fires caused by means of artificial lighting. It may be freely conceded that the figures are creditable to the electric lighting undertakings, and even more so to the fire offices, and particularly the Phœnix, which was the first office to draft rules for interior wiring. It is stated that, thanks to the firm stand this office made in this matter in the early days of electric lighting, it has not had to pay, from the commencement up to the present day, "one single sovereign" as loss in connection with any fire caused by electricity in a building wired in accordance with its rules.

Major Flood Page goes on, however, to confess that he views with alarm "the efforts of some electrical engineers who are advocating an increase, and in some instances actually increasing, the pressure at which they deliver the current of electricity to 220 volts, while the ordinary current has been 100 to 110 volts." He, as representing the Edison and Swan lamp manufacturing interest, avers that the question of making a suitable lamp is the smallest difficulty in connection with this change. A far more serious question, he contends, and one which touches very closely upon fire insurance, is whether houses wired with fittings and switches manufactured for 100 volts can safely carry 220 volts. He is evidently inclined to answer this question in the negative; but he contents himself with expressing the opinion that "it is far better that we should, for many a day yet, at any rate, be content with the useful safe pressure under which we have obtained the most satisfactory reports which these figures of the Metropolitan Fire Brigade show in connection with fire risks and electric light." The further question is suggested as to whether those central station engineers who are advocating this increased pressure are legally entitled to do so, inasmuch as the Electric Lighting Act, under which they are all working, provides that the undertaker "shall not be entitled to prescribe any special form of lamp or burner to be used by any company or person, or in any way control or interfere with the manner in which electricity supplied by them, under this Act and any Licence or Special Act, is used." The primary purpose of this provision undoubtedly is to prevent the undertakers from unduly favouring the lamp of any particular maker; but it certainly seems also to bear the interpretation put upon it by Major Flood Page, which is that the undertakers may not arbitrarily compel customers to change their lamps, as must necessarily be done if the voltage is to be doubled. This point, however, has not been lost sight of by the Board of Trade, who are advised to include in the new regulations to be issued under the Electric Lighting Act, a provision requiring the consent of the consumer to be obtained before any alteration is made in the voltage of the current. The gist of Major Flood Page's communication upon this subject is to urge that all users of electricity should give the matter of voltage their most careful consideration before they consent to its increase, "no matter what inducement may be held out by those who advise them to make the change." And to the advisers of electric lighting undertakers themselves he represents the unwisdom of raising the question "at the very moment when the insurance offices are somewhat uneasy as to the risk involved in central stations and electric works." This is putting a "spoke in the wheel" of the electric lighting engineers, with a vengeance. It cannot be doubted that the caution, coming from such a quarter, will be taken to heart by those whom it concerns. As we have already argued upon the same side, users of electric lighting have nothing to gain from an increased voltage, which is advocated solely in the interest of the suppliers of current from central stations. Why they should trouble themselves in the matter at all is only to be explained on the assumption that, by consenting to the proposals of the undertakers, they would help the latter to make their business pay better than is possible under the old conditions—thus ensuring a cheaper supply of current. This reason would be good enough if it were tenable. But even then the prospect of ulterior benefit would have to be weighed against the certainty of immediate increased cost for lamps and risk of trouble with the connections. A 100-volt supply is trying enough in some circumstances; and one contemporary, claiming to have experience on the point, goes so far as to assert that whoever has heard a 220-volt fuse go with a bang "like a pistol-shot" will be chary of believing in the harmlessness of such a current. Now, anything that "goes off with a bang" is greatly disliked by the average householder, and especially by his womenfolk, whose susceptibilities require the more consideration the higher the household stands in the social scale. On the whole, therefore, our further inquiry into the new scheme of progress in electric lighting tends to confirm the judgment we have already expressed regarding it—that the average consumer has nothing to gain and a good deal to risk by encouraging it, at any rate for the present.

## GAS MANUFACTURE AND CHEMISTRY UP TO DATE.*

The title we have chosen for our notice of Mr. Butterfield's book may be regarded as a sufficient commendation of the work; and we are not disposed to say anything to materially qualify this initial testimony to its character. It is only fair to the author and his publishers, however, as well as to readers of the Journal, that we should proceed to give such further account of this important book as will serve to indicate the grounds upon which our appreciation of it is based. First, there is to be considered the need for such a work at all, as to which there cannot be two opinions. It is true that there are a great many books appealing to the limited purchasing powers of students and followers of every modern industry, gas manufacture not excepted. But it is equally true that the number of really indispensable manuals relating to the latter industry is small. In the current "Programme" of the Technological Examinations of the City and Guilds of London Institute, only eight text-books are catalogued for the guidance of candidates in "Gas Manufacture," and of these but three deal specially with the chemistry of the industry. We have not many more works of reference of the same order upon our bookselves; the latest and most notable being the "Gas Engineer's Laboratory Handbook," by Mr. J. Hornby, which is also mentioned in the "Programme." This, like the one now under review, is a bye-product of the Beckton establishment. In his preface, Mr. Butterfield duly acknowledges the value of Mr. Hornby's work, which is, as he says, well qualified to serve for an introduction to his own larger treatment of the subject of gas manufacture from the point of view of the chemist in the works, as well as in the laboratory. What was needed, therefore, after Mr. Hornby, was an authority to discourse acceptably on the chemical aspect of the industrial operations by which those products of coal carbonization of which the analyst in his laboratory takes account, are obtained on the large scale. We were quite prepared, from previous knowledge of Mr. Butterfield and his work, to welcome in him the authority called for; and we trust to be able to show our readers that his book is worthy of the theme and the author. Mr. Butterfield's aim is high; for it is no task for any other than a master-hand to lay bare the underlying chemical principles of the gas manufacturing operations of the present day. The duty of a critic of any book pretending to do this is, moreover, not light; inasmuch as while no work should be accepted as a text-book without sufficient justification, almost as much knowledge of the subject ought to go to the criticism as to the writing thereof, and few there be who would care to pretend to such mastery of an industry which has not by any means been reduced to an exact science.

The science of chemistry and the industry of gas manufacture have both made such strides during the last few years, that old books dealing with the chemical side of gas making are of little use to the modern student. The question of carburetting, for instance, interests gas manufacturers nowadays in a very different way from anything of which their predecessors, for whom Lewis Thompson and Hartley wrote, had cognizance. The chemical effects of forcing the gas-making capacity of retorts, as is done in connection with the use of stoking machinery and gaseous firing, are problems peculiar to the experience of the modern gas manager. The question of carburetted water gas is one of yesterday, to-day, and to-morrow. The problem of the most advantageous grade of illuminating gas to be supplied under given conditions, calls for the assistance of the chemist in its solution. A good book on gas-works chemistry should be a perfect arsenal of weapons wherewith such difficulties as the gas manager may expect to encounter in approaching these and other problems might be attacked; and this requirement is fairly satisfied by Mr. Butterfield's work.

The author begins at the beginning, with the raw materials of

*"Gas Manufacture: The Chemistry of. A Practical Handbook on the Production, Purification, and Testing of Illuminating Gas, and the Assay of the Bye-Products of Gas Manufacture. For the Use of Students, Chemists, and Gas Engineers." By W. J. Atkinson Butterfield, M.A., F.C.S., Head Chemist, Gas-Works, Beckton. With numerous illustrations. London: Charles Griffin and Co., Limited; 1896.

gas manufacture, which he classifies upon a new plan into materials for (1) the production of coal gas, (2) the production of water gas, (3) the production of oil gas, and (4) enriching gas of low illuminating power. He then proceeds to define the nature of the materials thus classified. He approaches coal through the preliminary forms of cellulose, peat, and lignite; and he considers it primarily under the heads of "Caking," and "Non-Caking" coals—reserving the richly bituminous cannels to the end of the section. It is admitted that the phenomenon of caking, which eventuates in coking, does not appear to have anything to do with the ultimate composition of the coal, but rather depends upon "the forms of combination of the elements existing in it." The author has some valuable practical hints to give respecting the analysis of gas coals, and also as to the evaluation of the data derived from analysis and laboratory testing. Here speaks the expert, with unexampled clearness and point. If Mr. Butterfield's work contained no more than this matter, so fresh and good is it that the book would be worth its cost on this account alone.

Mr. Butterfield appears to know all about gas oils; and what he knows he tells in a style intelligible to the youngest student. He fully discusses "carburine" and other volatile petroleum essences used for carburetting gas, and recognizes the promise of benzene in this capacity. He devotes a separate chapter—of great value, though short—to the subject of "Enriching by Light Oils," which fully acknowledges the advantages of the carburine method, and leaves the value of the benzol process an open question. It may be remarked here that the claims of 90 per cent. benzol—the best grade of the commodity for the purpose—must be seriously prejudiced by the present unsteady market value of it compared with the more abundant petroleum spirit.

In treating of gas manufacturing plant, Mr. Butterfield betrays the fact of his being upon shakier ground than when discussing chemical matters. For example, he tells his readers with truth that while the ⌂-shaped retort is most employed, "occasionally retorts of oval or even circular cross section are used, but do not give such high results in gas made, though some engineers consider the oval-shaped retorts rank with the ⌂-shaped in this respect;" and he gives 20 in. by 13 in. as the "usual dimensions" of the ⌂ retort, admitting, however, that 22 in. by 16 in. are "now common." He says that single retorts are only adopted "where the number of stokers does not allow of charging from both ends simultaneously. Wherever this is possible, though 20-feet retorts are used, as they are more economical of heat, and give less trouble in scurfing." The word "though" is, of course, a misprint for "through"—the misprint occurring, as generally happens, to spite author and proof-reader, in an awkward place. The truth of this business of retort sizes and sections is not fully expressed here. It is a source of complaint by the manufacturers that there is no agreement among gas managers with regard to the best size and form of retort; but 13 inches is too low for comfortable drawing with a full-sized rake. Also, a circular retort of rather small diameter is by no means such a bad gas maker as Mr. Butterfield appears to think. And what about the dividing of through retorts so as to meet the difficulty of stopped pipes? By the way, what is Mr. Butterfield's position, as a works chemist, upon the latter point? We have failed to find any expression of opinion regarding it in his book, which is a pity. He dismisses the subject of gaseous firing, also, in a very summary fashion; merely observing, by way of introduction, that "generator furnaces on the regenerative principle are now almost universally used, but the number of systems of applying it is legion. In some few works, direct firing is still in use; but it is uneconomical of fuel. In others, a compromise is made by using a shallow generator, and admitting a small supply of secondary air." This is true enough; but might not the student ask what these terms mean? Could not the author have paused here to explain the difference between a generator and a direct furnace, and to describe when air is "secondary," and why? This slightness of treatment of a highly important point of technics is disappointing. It is the same with regard to the hydraulic main. This piece of apparatus is dismissed in a paragraph of twenty-three lines, which might have been written by anybody as well as by a chemist, who should have allowed himself space to discuss the chemical aspects of wet and dry main working, which Mr. Butterfield has utterly neglected. He thinks that mechanical devices for enabling the hydraulic seal to be dispensed with "have not, up to the present, presented an alluring aspect to English gas engineers." The remark, besides being clumsily worded (a rare fault with this author), betrays a limitation of knowledge. Some of the best gas managers in England believe in, and work with, a dry main, which can be done with the greatest ease, although possibly not with the safety of the hydraulic main in such a huge establishment as Beckton. There are those who say, however, that "they don't know everything down" at Beckton. Our general complaint against Mr. Butterfield's treatment of the various departments of a gas-works is, in brief, that he sinks the chemist too completely when cursorily describing plant which, while designed to conform to physical and mechanical ends, has yet a chemical side; and, to be plain, we prefer him in his capacity of chemist, when he writes with a degree of authority which is not apparent in his handling of engineering topics. Thus, it is not sufficient for a writer upon retort-stoking machinery to remark of a particular system that it "has probably been more extensively tried than any other"—an ambiguous way of putting it—and that certain makers' plant "has been brought by them to a high state of efficiency, productive of great economy." The technician wants figures to show what the machine is capable of doing. Again, it is stated in the book, with reference to inclined retorts, that "it is asserted that the make of tar is somewhat lower than with horizontal retorts, and this points to a greater production of gas." Is this quite a worthy way of treating the point? Is there not more definite information respecting the working of inclined retorts to be obtained by a chemist of Mr. Butterfield's undoubted standing and opportunities?

We like the passages of the book treating of the chemical points of coal carbonization, and more particularly the chapters relating to the testing of materials and products. Here the author is at his best; and his best is very good indeed. His criticisms upon the ordinary methods of carbonizing coal, upon the possibility of improving the yield of ammonia, and upon purification problems, are distinctly fresh and helpful. His modernity may be inferred from his suggestion that something might be done with a combination of Weldon mud and oxygen. Upon carburetted water gas, as made in English gas-works, Mr. Butterfield is in the happy position of being the first systematic writer in text-book form. He seems to be a safe guide through the niceties of carburetted water-gas practice; but he avoids criticism when describing the various oil-gas processes, proprietary and otherwise, that he finds worthy of mention. The latter half of the book is devoted to gas analysis, photometry, the applications of gas, and bye-products. These subjects are all treated in an original, and some of them in a masterly manner.

In conclusion, we can strongly recommend the book to our readers, with the assurance that it is by far the best work of the kind we have ever had the pleasure of reviewing. It is not faultless, of course; but where the author fails, it is in consequence of his natural limitations as an expert gas-works chemist. In pointing out these shortcomings, we have been inspired by the hope of seeing them made good in a future edition. The illustrations are for the most part from original drawings; but they do not constitute the most admirable feature of the work. The author's easy style of composition renders reading him pleasant; and he has provided his volume with a full index, which is of great convenience in a work of this character.

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**Institution of Civil Engineers.**—An interesting memorandum has been issued by the Secretary of the Institution of Civil Engineers (Mr. J. Forrest), giving the names of those who have belonged to the Institution for upwards of fifty years, and of others who were elected between the years 1845 and 1850. In the former list, we find the names of Dr. W. Pole, F.R.SS. L. and E. (Honorary Secretary), Mr. T. Dyne Steel, and Mr. A. Upward; and in the latter, Sir R. Rawlinson, K.C.B. (Past-President), Mr. H. Robinson, and Sir Douglas Galton, K.C.B. At their first meeting after the Christmas recess—on the 14th prox.—the members will read and discuss a paper by the Hon. R. C. Parsons, M.A., entitled "The Sanitary Works of Buenos Ayres: Sewerage, Drainage, and Water Supply."

**The Assistant-Engineership of the Calcutta Corporation Water-Works.**—As will be seen by an advertisement which appears elsewhere, a vacancy has occurred in the water-works department of the Calcutta Corporation, consequent upon the death of Mr. Dickson, C.E., who for many years occupied the position of Assistant-Engineer. The appointment is an important one, having regard to the magnitude of the works, which are capable of supplying 25 million gallons of water per day, the greater part of which has to be filtered; and the whole is distributed on the constant supply system. There are seven pumping-stations, with an aggregate of 3450 indicated horse power, which is considerably larger than the majority even of the London Water Companies. Messrs. Joseph Quick and Son, of No. 39, Victoria Street, Westminster, are Consulting Engineers to the Calcutta Corporation.

**Personal.**—Mr. W. J. Atkinson Butterfield, M.A. (Oxon.), has resigned his appointment at the Beckton Gas-Works. He was the only officially appointed "Chemical Assistant to the Engineer" (to quote the terms of the Directors' minute) on the small staff of those works, which of course are quite distinct from the Tar and Liquor Works also belonging to The Gaslight and Coke Company.——The Hinckley District Council have resolved to increase the salary of Mr. G. Helps, the Manager of the gas-works, by £30 per annum. Since Mr. Helps commenced his duties in 1893, the output of gas has augmented by 3,253,000 cubic feet, with an increased revenue of £1567 for gas and £437 for residual products.——Mr. H. J. Clarson, C.E., of Tamworth, has been engaged to advise the Ibstock local authorities as to a water supply scheme for the district.——Mr. H. Airey, whose relinquishment of the position of Chief Inspector of the Spitalfields gas-meter testing-station of the London County Council was mentioned in the JOURNAL for the 10th inst., has been awarded a pension of £141 13s. 4d. per annum.——The Paris Academy of Sciences has awarded the Lecomte prize of 50,000 frs. to Lord Rayleigh and Professor Ramsay, for their researches which led to the discovery of argon.

# NOTES.

### Testing Cement for Resistance.

Discussing the utility of heat tests of portland cement, M. Le Chatelier, who was appointed by a French Government Commission to inquire into this subject, points out that, in course of time, all hydraulic cements and limes employed in building and engineering construction become disintegrated by various natural influences. The longer a cement resists disintegration in this way, the better it is; and it therefore seems to be the first requirement in cement testing that the methods employed should be calculated to show the degree in which the test sample possesses the power of resistance. Yet, as a rule, tests of cement have not been specially directed to the determination of this degree. The causes of the disintegration of cement are many; but they are divisible into two great classes. The first comprises those influences which apply only in certain circumstances, as the action of sea water, frost, the sun's heat, and so forth; the second refers to those which act under all conditions, as water and carbonic acid. The latter are less energetic in action than the former. In durability or resistance tests, the cement is usually moulded into pats, with thin edges. After twenty-four hours, the pats are tested by comparative experiments with cold water, in air, in kilns heated to 120° C., in a gas-flame up to red heat, in water brought to the boiling-point in an hour and a half, and kept boiling for at least six hours. Professor L. Tetmajor found in this way that, out of 139 samples of cement, only two showed signs of disintegration after lying in cold water for three years. In the air, 18 samples altered completely, and seven showed less marked deterioration. The boiling test destroyed seventeen samples completely, and developed cracks in eleven others. All the cements that disintegrated in air suffered sudden destruction under the boiling test, with the difference that, while in air the mischief did not become apparent for a year, it was developed in six hours by boiling. It is important to notice that a certain agreement showed itself between the times necessary to reveal disintegration in air and in water respectively; but the results obtained do not admit of the deduction of definite relations in this regard. The kiln and red-heat tests yield results identical with the boiling-tests. It is concluded that, the boiling test is excellent for portland cement, inasmuch as it shows in six hours what the cement would be like after a year's exposure to air. No bad cement or hydraulic lime can withstand the boiling test; but the converse has not yet been established—that all cements unable to stand the test are really bad.

### Coal Conveying by Flume.

It is reported that a peculiar kind of coal conveyor is employed at some mines situated at Horr, Montana. It was found by the mining company that any tramway system for conveying the small coal the distance of 8400 feet from the washing-plant to the coke-ovens would be too expensive when of sufficient capacity. It was accordingly decided to try the experiment of water carriage; the small coal being borne along a "flume" constructed of planks made of 2-inch fir boards nailed together to form a rectangular trough 8 inches square in section. The line has a minimum gradient of 2·8 per cent. The arrangement is stated to work splendidly; carrying over all the coal that is put into it without cost, except interest upon the outlay on construction. At the end of the shoot, the coal and water are received in settling-tanks arranged in pairs, so that one can be emptied while the other is being filled. When the first tank fills, and the water begins to overflow, it is perhaps one-third full of coal; and the overflowing water carries with it into the bottom of the second tank a quantity of very fine particles of coal, almost as fine as flour. This small stuff makes good coke. All the coal is coked for metallurgical purposes. Where the flume had to be laid at a steep gradient, the wood was lined with sheet iron to prevent excessive wear. The company are contemplating the erection of another large flume to convey the lump coal.

### A Large Water-Main.

One of the largest jobs of water-main laying in the world is in progress in connection with the water supply of the city of Allegheny, Pennsylvania. The trunk main is of steel, 60 inches diameter, and 10 miles long. It was planned by Mr. Robert Swan; and it is expected to convey 50 million gallons of water per day. The metal for its construction is specified to be soft, open-hearth steel, having a tensile strength of from 55,000 to 65,000 lbs. per square inch; elastic limit, 32,000 lbs.; elongation, 25 per cent. in 8 inches in the longitudinal direction, and 22 per cent. across the direction of rolling; reduction of area, 50 per cent. The metal is not to contain more than 0·05 per cent. of sulphur, phosphorus, or silica; the content of carbon being limited by the physical requirements. The plates must allow cold scarfing to a fine edge without showing signs of fracture. The shop rivets are to be of the same metal as the sheets. The pipe is made up in the shop in lengths of four plates—inside and outside courses alternating. In the trench, the pipe is laid so that the longitudinal seams of all inside courses on the straight are in line, with the caulking edges facing upward. The sheets are 1¼ inches thick; and the whole pipe-line will weigh 3500 tons. The edges of the plates are planed to a bevel of 63° with the flat, and after riveting and caulking, as in boiler work, the whole pipe is japanned by the Sabine process.

### Electrolysis in Boston.

It is reported by Messrs. Stone and Webster, to the Water Department of the City of Boston, that the trouble in connection with electrolysis of the pipes buried in the city streets has practically been cured by the improved measures taken by the electric tramway companies. The satisfactory feature of this report, which is summarized in the *Engineering Magazine*, consists in the information it supplies that the electrolysis of pipes can be prevented by the use of proper precautions. It is admitted that, in certain places in the city, electrolytic action is still taking place; but the pipes, which have already been more or less injured, are now merely decaying prematurely. Excavations which have been made in different localities, for the purpose of inspecting the pipes, have given only negative results; revealing nothing in the way of distinct action, and yet not supplying proof that the natural decay of the metal is not being accelerated by electrolysis. Action of a serious character is confined to particular places, where, owing to certain peculiarities of the railway system, abnormal currents are flowing through the earth; but, as a whole, the action has been reduced to so small an amount as to be difficult of detection. In the places where much action is found, special precautions in regard to the provision of return feeders, and connections of the street railway system to the mains, will be relied upon to reduce it to insignificance. It is thought to be impracticable to entirely eliminate electrolytic action; but by contant inspection of the water-distributing plant as a whole, with the view to locating points where difficulty is liable to occur, and then applying remedies which have become well known, it is considered that the danger can be reduced to a minimum.

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**Received.**—"L'Eau Potable." By F. Coreil, Director of the Municipal Laboratory of Toulon. With 136 illustrations. (Paris: J. B. Baillière et Fils.)——"Calvert's Mechanics' Almanack and Workshop Companion." Compiled and edited by J. Nasmith, Assoc.M.Inst.Mech.E. Thirty-third year. (Manchester: John Heywood.)

**Death of Mr. T. S. Weeks, of Torquay.** — Mr. T. S. Weeks, Assoc.M.Inst.C.E., the Water Engineer of the Torquay Corporation, died on the 14th inst., at the age of 75. He was the oldest official in the employ of the town, and had managed the local water supply ever since 1858. When he first entered the service of the Local Authority, the water supply was derived from two small local works and from wells. In 1856, an Act of Parliament was obtained, authorizing the construction of the existing works; and with these Mr. Weeks was closely connected to the time of his death. In the recent controversy respecting the water supply, Mr. Weeks played an important part as an advocate of the Town Council's scheme for the purchase of the watersheds. At the funeral last Tuesday, there was a very large attendance, including the Mayor (Alderman E. P. Bovey), members of the Corporation, borough officials, and many prominent residents in the town.

**The Proposed Memorial of Mr. Denny Lane.**—Last Tuesday a public meeting of the citizens of Cork, convened by the Mayor (Mr. P. H. Meade), in accordance with a numerously and influentially signed petition, was held at the Imperial Hotel, for the purpose of taking steps to perpetuate the memory of the late Mr. Denny Lane, in such form as might be desirable. The gathering was in every way a representative one. The Mayor, in opening the proceedings, referred in appreciative terms to the high qualities possessed by Mr. Lane, who, he said, was a man of whom any city in the kingdom might justly feel proud. He suggested that, as Mr. Lane had devoted his life to science and art, it would be well if they did something towards fostering and helping, as he had done, students of a scientific or artistic turn of mind. The Mayor added that he had received a letter that morning from the Engineer of the Waterford Gas Company (Mr. G. Anderson) enclosing a cheque, and paying a high tribute to his late friend. Mr. Maurice Healy, M.P., proposed the first resolution, which conveyed to Mrs. Lane and the family the heartfelt sympathy of the citizens with them in their bereavement. Mr. Crosbie moved the second resolution, expressing the feeling of the citizens that it was incumbent upon them to recognize in some substantial and permanent manner the many noble qualities and the great ability possessed by Mr. Lane. He said a bust had been suggested by Mr. Lane's friend at Waterford; but he (Mr. Crosbie) was of opinion that it should be supplemented by something calculated to perpetuate his memory in gifts such as those he was in the habit of making every year of his life. Mr. O'Brien considered a bust and a scholarship would be an inadequate memorial; and he suggested a public statue in one of the principal thoroughfares of the city. The Mayor thought that the idea suggested by Mr. Crosbie, who was conversant with the views of the family, was the most suitable. This proposition was accordingly adopted; and a Committee was formed to carry it out. A subscription list was at once opened, and it was headed by a sum of £100 from the Cork Gas Company. Mr. G. Lynch, their representative on the occasion, stated that Mrs. Lane and her daughters strongly disapproved of the proposed statue. He thought Mr. Lane himself would have approved of a scholarship, or something similar, being founded at the School of Art. The proceedings closed with a vote of thanks to the Mayor. A sum of upwards of £300 was subscribed at the meeting.

# TECHNICAL RECORD.

## AMERICAN GASLIGHT ASSOCIATION.

### Discussion on Mr. A. C. Humphreys' Paper on Photometry.

In recent issues of the JOURNAL (*ante*, pp. 922, 976, 1034, 1086), we published the paper read by Mr. Alex. C. Humphreys at the last meeting of the American Gaslight Association, on "The Commercial Value of Photometry." We now reproduce from the *American Gaslight Journal* the remarks to which it gave rise.

Mr. CHOLLAR, in opening the discussion, referred in a complimentary strain to the paper, but took the ground that, in spite of Mr. Humphreys' arguments, nine-tenths of those familiar with photometrical work were of opinion that there was something wrong. He said if naked lights were covered by opal globes, the photometer showed that 60 per cent. of the light was lost; but the effect was to make the light softer and more diffusive. He had looked without success, in dictionaries and scientific works, for a specific definition of a diffusive light, and of the property of diffusiveness of light. Here was something which the photometer did not explain. He admitted that light from a point decreases inversely as the square of the distance; but light approaching a point, as in the case of a convex lens, increases in proportion to the square of the distance, otherwise the telescope and microscope would be impossibilities. Without such increase, there could be no focus. Parallel rays, such as the rays of the sun, neither increased nor decreased. Light from a globe gave converging, diverging, and parallel rays; light from a point, only diverging rays. Consequently, it was not diffusive; but light from a globe was soft and diffusive. The definition of diffused light was that it did not decrease in proportion to the square of the distance. Light converging to a point advanced in concave waves—the reverse of light from a point. If one decreased according to the square of the distance, the other must decrease. Parallel rays, as from the sun, reached out indefinitely. The trouble with the photometer was that it took no account of softness of light. A soft light was more like a glow. In the commercial testing of gas lights, the light should be entitled to a correction in proportion to the angle it subtended—in proportion to the size of flame, and inversely with the sharpness of shadow. Light from the electric arc approximated closely to the law of inverse squares, and cast a sharp and intense shadow; but light from the clouds, composed of diverging rays, was soft and diffused.

Mr. HINMAN said he thought the paper left little for remark. He considered Mr. Humphreys had demonstrated the complete accuracy of the bar photometer for measuring the amount of light from different sources. But there were some other things it did not measure, as colour and intensity per unit of source. He thought the much discussed diffusibility was simply a question of intensity. For example, in examining a printed page, the effect depended upon the surroundings. If the eye met a bright light, the page might be insufficiently illuminated; whereas the same amount of illumination on the page in an otherwise darkened room would give a brilliant effect. It was a question of the eye and the surroundings. A light giving less illumination might be more valuable because of more uniform distribution. A light of high intensity within the range of vision confused the eye, and good effects were not obtained. As to shadows, with a large light of low intensity, to obtain the same candle power the flame must be larger, and so the shadows were not so sharp. This question of shadow was practically of great importance. Referring to the details of photometry, various points were to be considered. First, the question of the standard and the test burner. If the law designated a certain test burner, that question was settled. But the legal burner was not necessarily the one employed in practice; and the results obtained were often widely different. He had tested gas in the Argand (which happened to be the one best adapted), and found 16-candle power; while with flat-flame burners he obtained, with the same gas, only 8 or 10 candle power. With regard to standards, whether candles or pentane, he thought there was something to be said on both sides. Candles, properly used, were fairly reliable. He had not used the pentane standard; but there seemed to be no doubt that it was more uniform, though possibly harder to use. With regard to the style of photometer, he preferred the cabinet to the open form; but it was important that the former should be properly and amply ventilated. With regard to the disc, he had used both the Bunsen and the Leeson star disc, and preferred the former; but he thought good results could be obtained with both. He considered it was necessary to use two mirrors; and he regarded the reversal of the disc as of great importance. He had found the readings of the two sides of a disc to vary as much as four candles; and frequently the variation would be one candle. As to corrections for barometer and thermometer, they were necessary for scientific work. But in the United States there were some cities at a great height above the level of the sea; and the consumer was not likely to be satisfied by the statement that at a barometric pressure of 30 inches the illuminating power would be 25 candles. He did not suppose that any companies corrected their bills by the barometer.

Mr. PRICHARD said he became interested in this subject some years ago, and believed that the illuminating value of gas, as measured on the bar photometer, differed from its commercial value. At the time referred to, the arc light had recently entered the field; and the ratings of candle power given out in connection with these lights were an incentive to look into the matter. As he did so, he became more and more convinced of the difference spoken of. That there was such a difference he thought was true, for several reasons; and he considered that Mr. Humphreys' complete paper amply bore out this idea. Mr. Humphreys said: "A measurement of the spherical candle power of the light-source and the determination of its colour composition will, as far as possible, enable us to estimate the light-effect obtainable under varying conditions." Apparently two of the reasons for this difference were here shown. In comparing an incandescent lamp and a gas-flame, the horizontal bodies of rays coming from each lamp were measured, and both were said to be 16-candle power. In the case of the arc, its light was measured at 45° from the horizontal, and then it was claimed to be of 2000-candle power. Such a claim was not fair to the incandescent light and the gas light. If measured spherically, the candle power of the arc would be only 500. While he did not know exactly the spherical candle power of a gas-flame, he thought it varied with the maximum luminosity and with different kinds of flames, and also with the thicker flame of water gas. This one point alone showed the difference between the photometric and the commercial value. He also thought, as suggested by Mr. Hinman, there was a difference as to the area of the light-source. It must make a great difference whether the source was 3 square inches, as in a gas-flame, or 0·0035 inch, as in an incandescent lamp, or 1 inch, as in the arc lamp. To furnish an estimate of the commercial value of a light, the photometer should take notice of this difference of area. If, on entering a room, an arc lamp was found to be level with the eyes, it was not possible to distinguish anything. And so, in a smaller degree, with an incandescent lamp; in a still smaller degree with a gas-light; and least of all with a gas-jet enclosed in an opal globe. This was the reason why the light surrounded by an opal globe was considered as giving a better effect in spite of the photometric value being reduced. As to colour, there should be discrimination. An equal amount of red or green light thrown into the meeting-room would fail to illuminate it as well as the lights then in use.

Dr. LOVE said the paper naturally interested him greatly, for he had been for twenty years engaged daily in photometric work. He thought the theoretical points of the subject could be best discussed by physicists. He agreed substantially with the paper, and thought they were under obligations to the author, who had threshed out the subject so well. He was glad Mr. Humphreys had dealt with the subject from the spherical wave standpoint. It was misleading to consider light as moving in straight lines. He would, with their permission, call attention to his own methods in photometry. For nearly twenty years he had used the star disc enclosed in glass. He first tried the Bunsen, and then the Leeson disc; but he found the latter unsatisfactory on account of the "buckling" of the paper. Mr. Dibdin had not at that time suggested his improvement. He devised the glass enclosed disc eighteen years ago, and had found it satisfactory; and he thought that anyone who used it would never go back to the grease-spot disc. Every disc should be tested by reversing. With the glass-side disc, if once found true, it was apt to remain so longer than other discs; the glass tending to prevent change. The reversing of the entire box was more important than reversing the disc alone. This was a most important suggestion of the Dutch Committee. With regard to candles, in his (Dr. Love's) opinion, the United States was the dumping-ground for all the poor candles made. He thought he had wrestled with this subject more than had the Committee in London. He allowed himself a margin of 6 grains either way from 120 grains. There were some small points—such as particles of inorganic matter on the end of the wick, soot on the wick, and the curling of the wick—which accounted largely for the variation in candle results. Candles burning under these conditions gave unreliable results. With regard to Mr. Dibdin's standard, he thought it was going to be a good thing for those regularly engaged in laboratory work; but he feared it would be troublesome for the gas engineer. No doubt, it would be more reliable for scientific work; but he feared it would be too expensive. As to the objection that the unit was still the candle, he would suggest that all standards were arbitrary.

Mr. SOMERVILLE said he was reluctant to give up the use of the word "diffusive," which was objected to by Mr. Humphreys. It seemed to him that there was a difference in the diffusive qualities of lights. He could tell a gas-lighted store a hundred yards away—the light flooded from the windows. This was not the case with the incandescent electric light. Again, the electric light, as used for lighthouses, was not nearly so efficient as the old oil or gas lamp of much lower nominal power. Was not this due to a difference in diffusive power?

Mr. MILLER felt that nothing he could say could add to the strength of the paper. The ground had been covered, and nothing was left to be said. He would, however, ask Mr. Humphreys what had been the result with him of increase of temperature and poor ventilation in the photometer-room. Did it tend to make the candle power read higher or lower? Some of his experiences appeared to show that the effect was to make the reading against the gas, which to him did not seem to be theoretically correct. With regard to the point raised by

Mr. Somerville in connection with lighthouse work, he thought this was outside the subject. The paper assumed that the atmosphere was transparent. The reason a red light would do better in a fog was because it contained more of the red rays, and they were less refrangible. This was shown in the case of the setting sun.

The PRESIDENT (Mr. Walton Clark) asked Dr. Love and Mr. Hinman to give their experience in connection with the point raised by Mr. Miller, in regard to the effect of a vitiated atmosphere upon the apparent candle power of gas.

Dr. LOVE said he thought that theoretically it should affect both lights alike; but he had not made any exact observation in connection with this matter.

Mr. HINMAN cited a case supporting Mr. Miller's experience—the candle-power reading being reduced by improper ventilation. Whether or not this was a general experience, he was not prepared to say.

Mr. FORSTALL said he remembered that, in a paper read before one of the English Associations by Mr. Methven,* it was shown that an increase of the moisture in the air tended to depreciate the apparent value of the gas.

Mr. EGNER thought there was some optical illusion in connection with these questions of intensity and diffusion. If one looked at a 16-candle power electric light and a 16-candle power gas light, the former dazzled the eye the more because it was more intense. This probably led people to think that gas light was more diffusive. The quantity of light was alike; but in one case the intensity was much greater than in the other.

Mr. HUMPHREYS, in reply, expressed regret that apparently the paper and his object in writing it were misunderstood by some; but the responsibility, he acknowledged, rested upon himself, as he had not been able, through illness, to finish it in time for the members to study in advance. The paper was written with the idea of showing how the eye was deceived, and how discrimination should be made between facts and optical illusions. These modifying circumstances could not be provided against unless they were first located and defined. The eye was deceived, but the photometer was not. The photometer measured light by its effect, but did not measure the light-source. He did not consider there was any such general disbelief in the accuracy of the photometer as Mr. Chollar claimed. As asserted by him, there was a difference in the light effect whether or not a globe was used to enclose a light-source; and he had endeavoured to show the cause of this difference. One reason was that the globe allowed a more uniform spherical distribution. Even a transparent chimney tended to reduce the spherical variation; and a translucent globe had a marked effect in this direction. The shielding of the eye from the direct rays coming from the light-source was another reason for the difference. As to diffusion, he understood that the diffusion of light was its irregular reflection from surfaces other than those of reflectors. To estimate the value of light-sources, the light must be compared before there has been any diffusion; and this was as fair for one light as for the other. As to Mr. Chollar's reference to the use of lenses and reflectors in the case of telescopes, microscopes, &c., he thought there was hardly any necessity for reply. Light from a point would naturally be distributed spherically; but if a larger effect were needed for a special purpose, and the light were required to be sent all in one direction, a lens was used to concentrate or squeeze the light together, and send it forth in the one direction only. But there was nothing in such action to disprove the law of distances. The law could not be employed to measure the light given through a lens, because by the use of the lens the very spherical distribution upon which the law depended was rendered impossible. The rate of variation of intensity where a lens was used depended upon the character of the lens. In the case of the globe, the opposite effect was found, as the tendency was to make the spherical distribution more uniform. It was true that these and other effects were not obtained in the photometer. The measurement was made by comparing the lighting effect of the direct rays upon a white disc, and before any distributing elements had been brought into the comparison. The experiments made in connection with his former paper showed that the same results were obtained from different classes of light-sources. These were balanced against each other at equal distances from the disc. Then they were each moved out a foot from the disc, and the balance was found to be maintained. Again and again the lights were moved away by equal distances, and still no difference was found on the disc. In the recent experiment of the same kind, when comparing the light from flames of gas and kerosene oil, Dr. Elliott, of New York, had agreed with him in failing to find a difference. He would ask the question: "If there is this difference of 'diffusive' power, why did it not show itself on the photometer disc in these experiments?" The diffused light could not be fairly compared. A coloured wall would reflect more or less of the original light falling upon it according to whether the light contains more or less of the rays of that colour. Such conditions could not be provided for in advance, because all sorts of such conditions would be met. The different rooms of the same house, illuminated by the same light-source, would give varying lighting efficiencies on account of the variations in the colour absorption. As to shadow effects, he had simply touched on the subject, as his paper was already too long. Necessarily, as the light-source increased in size, light therefrom would get behind the shadow-making object more or less, and the effect would be softened, and the general illumination be more uniform. This in no way disproved, or had any connection with, the law of distances. The best effects could only be obtained by recognizing the governing laws; then determining the modifying causes; and keeping the latter in mind. Mr. Hinman spoke of a gas tested by an Argand burner showing 16-candle power, and later, with flat-flame burners, having only 8 or 10 candle power. But Mr. Hinman would not claim that this affected the accuracy of the photometer; rather simply that the light-source was reduced in value by the use of an improper burner. This was not a question of light distribution, but of efficiency of application of the gas. He was decidedly of opinion that the improved star disc gave the most reliable results, and especially where there was difference of colour in the lights. The points of the star should be observed. As to correction for the barometer in very high altitudes, he thought two different ones should be made. For local comparison of results, the correction should be made to the average local barometer as recorded at the War Office in Washington. But for general comparison of results—as, for instance, in such an Association as the one then in session—the correction should be made to the standard barometer. In a company he was formerly connected with, controlling many works in different places, this was an important question; and it was settled in the way mentioned. Mr. Prichard had referred to his admission that the measurement of the spherical candle power and the determination of the colour composition of a light-source would, as far as possible, enable one to estimate the light-effect obtainable under varying conditions. This he thought was in accord with the rest of his paper. He was prepared to admit the facts as he found them. If an arc lamp was measured at 45°, and the candle power so determined was taken as that of the lamp, the person accepting such a statement was in the wrong, not the photometer. It stood to reason that, for general illumination, the average spherical intensity must be considered. He could not speak of his own knowledge as to the pentane standard; but the names attached to the report of the Photometric Standards Committee were sufficient guarantee for the claims made in its behalf. He thought Dr. Love rather overrated the complexity of the instrument. As to Mr. Miller's question upon the effect of want of ventilation, in a recent case in his experience, using an open bar photometer in an insufficiently ventilated room, he found the effect was to reduce the candle power of the gas. Mr. Dibdin gave the accounts of results for and against the gas. Referring to Mr. Somerville's disinclination to give up the use of the word "diffusive" as applying to the quality of a light, he (Mr. Humphreys) had also found it hard to settle upon another word, and had been obliged to fall back upon "penetrating power," "carrying power," &c. He thought they should be careful to bear in mind that diffused light was irregularly reflected light, and that this should not be confounded with the improper (as he thought) reference to the diffusive quality of light. He did not think it had been, or that it could be, demonstrated that there was any such difference in the quality of different lights; but, on the other hand, he had been able, as shown, to make experiments to prove that the differences so claimed in certain cases did not exist. As to the relative efficiencies of lighthouse lamps, it was a question of the transparency of the medium. It was asserted that the light from the electric arc would not penetrate fog so well as the light from an oil or a gas flame; and while the assertion was disputed, he believed it to be correct. But this was a question as to the effect of a particular absorbent upon a light of certain colour composition. It was a very practical and important question; but it did not furnish an argument as to the relative diffusibility of different kinds of light.

* See JOURNAL, Vol. LIV., pp. 968, 1011.

**The Recent Stoppage of Gas Supply at Broughty Ferry.**—In the last two issues of the JOURNAL, our Scotch Correspondent referred to an accidental stoppage of the gas supply at Broughty Ferry, owing to the foreman neglecting to turn on one gasholder before another was emptied. This is an old trouble, and one which is liable to recur. It may therefore not be inopportune to call attention to a device patented some years ago by Mr. Magnus Ohren, Assoc.M.Inst.C.E., for preventing such accidents. His plan renders gasholders self-acting by fixing to the guide-bars, to the columns, to the holder itself, or to any other convenient or suitable place, guards to catch the guide-rollers and stop the ascent of the holder on its reaching the required height. The valves of all the inlets and outlets of the holders being open, the lightest holder will fill first, then the next lightest, and so on in succession, until all the holders in action are filled. During the supply, the heaviest holder will discharge first. This mode of construction will answer for any number of holders, however far apart they may be; care being taken to stop off each holder with sufficient seal, with the exception of the heaviest one, which should not be stopped off at all, so that it may "blow" when all the holders are full. The inlets and outlets being all open, any increase in bulk in a full holder in sunny weather will pass through the outlet, and go away with the make to the holder then filling. Though Mr. Ohren patented the arrangement, it was not with the view of following it up (the patent was never sealed), but of making it more generally known in the profession.

## DR. KNUBLAUCH ON THE NITROGEN AND THE NITROGEN PRODUCTS DERIVED FROM COAL.

(*Concluded from p.* 1243.)

Following the course of the gas from the washers to the purifiers, we find cyanogen as well as sulphuretted hydrogen is absorbed in the latter; and thus we are brought in contact with a second valuable nitrogen product. Cyanogen is very susceptible to chemical reactions; and it is not easy to trace its behaviour in the vessels in the presence of carbonic acid and sulphuretted hydrogen. The nitrogen of the coal which formed cyanogen during distillation, was little investigated until a few years ago.

The method which has been most used for the estimation of cyanogen in coal gas is quite unreliable, as it indicates the presence of cyanogen in gas which cannot possibly contain it. It consists in collecting the cyanogen in a solution of silver; but many other constituents of coal gas likewise form insoluble compounds with silver. The method is described in a book of even so late a date as 1890. Much confusion was caused by it; and even now, here and there we find it supposed that the thiocyanate occurring in fouled oxide existed as such in the gas. The quantity of it often considerably exceeds the amount of ferrocyanide. The patent on the extraction of cyanogen applied for by the author in 1888, first cleared up the question of the nitrogen occurring as cyanogen. It embraces a certain method of absorbing the whole of the cyanogen present, and securing it as ferrocyanide. The cyanogen wholly combined in that form is then determined by the method for the estimation of ferrocyanide in spent oxide. At the present time, cyanogen determinations are commonly made according to this method. Without further discussing theories, it may be said that the ferrocyanide, as well as the thiocyanate, is first formed in the purifying material from the hydrocyanic or prussic acid of the gas. If the latter enters into combination with iron, we have ferrocyanide; if into combination with sulphur, thiocyanate or sulphocyanide. Although thiocyanate is formed from hydrocyanic acid, sulphuretted hydrogen, and ammonia, these compounds pass along together in the crude gas without appreciable formation of thiocyanate as far as the purifiers; and even then the formation of thiocyanate is only partial. The feebly acid hydrocyanic acid is doubtless preserved as such by the large excess of carbonic acid. In the purifiers, therefore, we must force the hydrocyanic acid to combine with iron instead of sulphur; and we can readily effect this by fulfilling certain conditions in the process, based on present knowledge. But the results of a large number of tests of fouled oxide prove how incompletely the process is often carried out. The results of ten tests are given in the following table:—

| Sample. | Percentages on the Dried Samples of Spent Oxide. | | | | | | | Potassium Ferrocyanide if the Cyanogen were Converted to Ferrocyanide, instead of Thiocyanate. | | Percentage of Cyanogen in the Material as— | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Prussian Blue. | Potassium Ferrocyanide. | Thiocyanic Acid. | Sulphuric Acid. | Ammonia. | Soluble Salts. | Sulphur. | Increase. | Total. | Ferrocyanide. | Thiocyanate. |
| 1 | 14·06 | 20·74 | 0·068 | 1·735 | 0·596 | 3·24 | 41·15 | 0·08 | 20·82 | 99·6 | 0·4 |
| 2 | 13·61 | 20·07 | 1·290 | 6·160 | 2·660 | 12·00 | 36·10 | 1·54 | 21·61 | 92·9 | 7·1 |
| 3 | 13·56 | 20·00 | 0·440 | 6·830 | 2·620 | 13·62 | 30·27 | 0·53 | 20·53 | 97·4 | 2·6 |
| 4 | 11·85 | 17·48 | 2·630 | 2·150 | 1·540 | 7·50 | 38·35 | 3·14 | 20·62 | 84·8 | 15·2 |
| 5 | 10·58 | 15·57 | 3·270 | 2·700 | 1·560 | 9·50 | 35·37 | 3·90 | 19·47 | 80·0 | 20·0 |
| 6 | 10·33 | 15·23 | 4·200 | 3·510 | 2·550 | 12·00 | 30·15 | 5·02 | 20·25 | 75·2 | 24·8 |
| 7 | 9·06 | 13·36 | 4·410 | 4·500 | 3·260 | 14·70 | 33·57 | 5·27 | 18·63 | 71·7 | 28·3 |
| 8 | 8·57 | 12·64 | 6·960 | 2·110 | 2·480 | 13·50 | 28·38 | 8·32 | 20·96 | 60·3 | 39·7 |
| 9 | 8·10 | 11·93 | 6·150 | 10·800 | 5·510 | 22·79 | 32·10 | 7·34 | 19·27 | 61·9 | 38·1 |
| 10 | 3·38 | 4·98 | 13·750 | 5·380 | 5·490 | 28·31 | 32·30 | 16·42 | 21·40 | 23·3 | 76·7 |

The table shows that, beginning with only traces of thiocyanate in No. 1, the amount continually increases, while the quantity of ferrocyanide decreases. Of the total cyanogen, No. 1 contains only 0·4 per cent. as thiocyanate, and 99·6 per cent. as ferrocyanide; while No. 10 contains 76·7 per cent. as thiocyanate, and only 23·3 per cent. as ferrocyanide. The quantity of thiocyanate in sample No. 1 is technically negligible; and as a result of the author's experiments, the conditions are known under which no trace of thiocyanate is formed, but the whole of the hydrocyanic acid is converted to ferrocyanide.

Regarding the quantity of cyanogen formed in the retorts, numerous experiments at the Cologne Gas-Works, carried out at various times with Westphalian coal, indicate that 74 to 79 grains of hydrocyanic acid (HCN) per 100 cubic feet are present in the gas, or about 0·15 per cent. by volume of the acid in a state of vapour. This corresponds to 193 to 205 grains of potassium ferrocyanide, or roughly to 2·9 to 3·1 lbs. of potassium ferrocyanide, per ton of coal. It is generally less at the coke-ovens. Referred back to the coal, the nitrogen of the cyanogen amounts to only 0·02 to 0·03 per cent., corresponding to 1·8 per cent. of the total nitrogen of the coal. In order to illustrate the proportions in which the several constituents occur in crude gas, and in how small a proportion the useful nitrogen is, the average composition of crude gas from Westphalian coal is here given:—

*Average Composition of Crude Gas from Westphalian Coal.*

| | Per Cent by Volume. | |
|---|---|---|
| Hydrogen | 50·00 | |
| Methane | 31·00 | |
| Carbonic oxide | 9·00 | |
| Ethylene | 2·50 | 3·75 |
| Benzene, &c. | 1·25 | |
| Carbonic acid | 2·00 | 2·75 |
| Sulphuretted hydrogen | 0·75 | |
| Nitrogen | 2·25 | |
| Ammonia | 1·10 | 1·25 |
| Hydrocyanic acid | 0·15 | |
| Sulphur compounds other than sulphuretted hydrogen | 0·01 | |

The so-called diluents, hydrogen, methane, and carbonic oxide, form about 90 per cent.; and the obnoxious carbonic acid and sulphuretted hydrogen, about 2¾ per cent. The most important illuminating constituent, benzene (and toluene) vapour, occupies only 1¼ volumes per cent., and furnishes about 80 per cent. of the illuminating power of the gas; while ethylene (and its homologues) occupies 2½ volumes per cent., and is only responsible for 20 per cent. of the illuminating power. About 2 per cent. represents the free nitrogen; but the errors in the determinations of all other constituents are massed together in this, as there are no means of directly estimating nitrogen in gas. The nitrogen compounds are represented by 1·1 per cent. of ammonia, and only 0·15 per cent. of hydrocyanic acid. It will readily be surmised that the absorption of the latter must present difficulties, as in general the absorption of a gaseous constituent becomes more difficult as the proportion of its volume to the total volume diminishes. But with the hydrocyanic acid, there are other difficulties, due to the sulphuretted hydrogen and carbonic acid amounting almost to twenty times its volume. The materials used practically for extracting cyanogen, likewise take up with great avidity the sulphuretted hydrogen, and partly also the carbonic acid; so that a product is obtained which contains a large quantity of iron sulphide to a relatively small amount of ferrocyanide. It would be too wide a digression here to enter further into the author's experiments, which have resulted in the extraction of the whole of the cyanogen, while the carbonic acid and sulphuretted hydrogen are eliminated from it. On another occasion, we may come back to this process; but the remainder of this paper can deal only with the extraction of ferrocyanide from fouled oxide.

The nitrogen which in gas manufacture forms cyanogen, amounts, as we have just seen, to only 0·02 to 0·03 per cent. of Westphalian coal. But owing to the large consumption of coal, this item becomes very considerable; and the high value of the ferrocyanides renders this nitrogen a source of large revenue. At the beginning of the eighties, we find purification a considerable item of expenditure; and in many gas-works it still remains so. About that time, however, a favourable change was made at Cologne. The material formerly was a troublesome product, and fetched quite a small sum, until in March, 1882, it was sold on the basis of its content of ferryocyanide, after a method of estimating the latter had been worked out. The proceeds of the sale of the oxide (yielding 14 to 18 per cent. of potassium ferrocyanide on the moist material) amounted, for the six years, 1882 to 1888, to about £4400; the average production of gas being 554½ million cubic feet. Deducting the cost of raw material and wages, a considerable profit remained. The prices for rich material have risen since, so that the receipts are now even higher. Works the size of those at Cologne should extract yearly hydrocyanic acid equivalent to about 78½ tons of potassium ferrocyanide; while about half that quantity, according to the process now used, remains in the gas. There are, however, few works which obtain such good results.

We may next consider how much spent oxide is obtained in the purification of a definite volume of gas. As this depends on the quantity of sulphuretted hydrogen in the gas after the scrubbers, it is dependent in the first instance on (*a*) the yield of sulphuretted hydrogen of the coal carbonized, which is variable even with the same kind of coal; (*b*) the more or less complete removal of ammonia before the purifiers; and (*c*) the amount of carbonic acid in the crude gas. It is evident that the ratio of the spent oxide to the volume of gas treated may be very different, even at equally well managed gas-works. A good oxide, if the ammonia is completely removed before the purifiers, takes up at least 40 to 45 per cent. of sulphur, and

cyanogen equivalent to about 17·5 to 21·0 per cent. of potassium ferrocyanide (the percentages being in both cases reckoned on the dried material), before it begins to be troublesome in working. Many Westphalian coals give a yield of sulphuretted hydrogen corresponding to 14 to 17 cwt. of spent oxide, with 20 per cent. of moisture, per million cubic feet of gas. Less material may be used with some coals; but if the washing of the gas be incomplete, or the yield of sulphuretted hydrogen from the coal be greater, considerably more may be used up. Judgment cannot therefore be fairly passed on an oxide simply on the strength of the number of cubic feet of gas purified by a given amount of it. The quantity of material used in a large works during several years affords the best check on it.

The analytical results given above for ten samples of spent oxide, show how different may be the composition even with the same kind of coal. The first nine samples were fouled by gas from Westphalian coal, to which sometimes small quantities of richer coal were added, but to an extent unlikely to affect the results as far as the cyanogen is concerned. The differences in the amounts of ferrocyanide in samples Nos. 1 and 9 are as 21 to 12; but the material may contain even less than No. 9 does. Valued at their ferrocyanide content, and containing about 20 per cent. of moisture, at prices ruling during recent years, samples Nos. 1 and 9 would fetch respectively about £3 10s. and £1 18s. per ton. The total amount of ferrocyanide in oxide is frequently very small. Of sixty samples, four only produced over 15 per cent. of potassium ferrocyanide (over 18 per cent. on the dried material); while four gave under 6 per cent. (less than 7 per cent. on the dried material). Generally about 8·5 to 12 per cent. was obtained. It may be observed that, both in analyses and in commerce, the percentage of ferrocyanide is sometimes stated as Prussian blue. The amount of blue may be found by multiplying the amount of potassium ferrocyanide by 0·678. In the above table, also, the percentages are stated on the dried substance. With 20 per cent. of moisture, sample No. 9 would show 9·54 per cent. of potassium ferrocyanide, or 9·54 × 0·678 = 6·47 per cent. of Prussian blue.

The thiocyanic acid varies very much, amounting only to 0·068 per cent. in sample No. 1, and to 13·75 per cent. in sample No. 10. But if we assume that the whole of the cyanogen had been converted to ferrocyanide, instead of partially to thiocyanate, we arrive at nearly the same cyanogen content for all the samples. This is indicated in another column of the table. Reckoned as potassium ferrocyanide, it averages about 20 per cent. This proves that there is no deficiency of cyanogen in the gas, but that only with sample No. 1 did the conditions exist for the formation of ferrocyanide exclusively. How deep seated is the reaction, may be seen from the formation of 10·8 per cent. of sulphuric acid and 28·3 per cent. of soluble salts in sample No. 10. These soluble salts envelop the particles of iron which should enter into reaction; and thus the absorptive power for sulphuretted hydrogen is little, and these salts are necessarily removed and replaced with the material—thus increasing the wages. Moreover the material is much denser; and the gas passes through it with difficulty, causing back pressure. It purifies very badly, and takes up comparatively little sulphur; so that more material is required. While sample No. 1 gives 41·15 per cent. of sulphur, in No. 8 there is only 28·38 per cent., and in Nos. 2 to 10 an average of only 33 per cent.

Why is it that the amount of ferrocyanide from the same coal varies so greatly as in samples Nos. 1 to 9? Experiments and observations show that the ammonia only is to blame. In No. 1, with its large percentage of ferrocyanide, the ammonia amounts to only 0·596 per cent.; while with No. 9, it amounts to over 5 per cent., or almost ten times the quantity in No. 1. The ammonia still present in the mass affords no clue to the amount passed through when it is so high, as in such a case it is not wholly absorbed. Doubtless in Nos. 9 and 10 some ammonia has been left unabsorbed, and would act disastrously on the meters. Ammonia is further inimical to the formation of ferrocyanide in oxide purifiers (the wet process with alkaline or ammoniacal iron proceeds quite differently), but favours the formation of thiocyanate and soluble salts, and therefore causes interruption to the purification in general.

Complete extraction of ammonia means, therefore, the highest possible formation of ferrocyanide; and therefore perfect washing of the gas must be aimed at. We have already seen that the complete removal of ammonia is attended by a very great absorption of sulphuretted hydrogen and carbonic acid; and thus the purifiers are much relieved. At the same time, the cyanogen is compelled to combine with iron instead of sulphur; while the oxide serves for a larger quantity of gas, can remain in the vessels for a longer period, and finally be easily and certainly revivified. The spent material frequently fetches little or nothing in respect of the ferrocyanide it contains. A good sample, however, sells for £3 to £3 10s. per ton; and therefore the purification of gas should now form a considerable source of revenue.

These considerations indicate also that a complete analysis of the purifying material can enable us to draw conclusions as to the efficiency of the scrubbing and washing process. The author has, in all such cases referred to him, found his inferences confirmed by later experiments on the works. The processes taking place from the retorts to the purifiers have been traced step by step, after the introduction of chemical work in the industry. It is thus even possible, from the analysis of a by-product, to decide whether, and to what extent, the whole apparatus is acting as it should. We can now follow the course of each molecule of nitrogen in the coal clearly and certainly; and on the basis of experiments, we can surely work for a quantitative yield of cyanogen compounds, while extraneous advantages also accrue to the general working.

Reviewing what has already been said, and confining ourselves, for the sake of simplicity, to the case of Westphalian coal used in gas-works, we find that the nitrogen of the coal is distributed as follows:—

1.—About 50 per cent. remains in the coke, and is only of interest because an increase in its amount means a corresponding decrease in the free nitrogen in the gas.

2.—About 30 per cent. is found in the gas as such, and must be considered injurious, as diminishing the illuminating power.

3.—From 12 to 14 per cent. is converted into ammonia; corresponding to 10·4 parts of sulphate per 1000 parts of coal (with English coal, it is much greater).

4.—Not quite 2 per cent. (0·027 per cent. of the coal) combines with carbon and hydrogen to form hydrocyanic acid; corresponding to a yield of 1·4 parts of potassium ferrocyanide per 1000 parts of coal. Of this quantity, at least two-thirds should, with proper working, be recovered in the oxide.

5.—Finally in the tar, as nitrogen bases, there is about 1¼ per cent. (0·02 per cent. of the coal).

6.—Only 0·2 to 0·25 per cent. of the nitrogen of the coal forms products of marketable value; but the quantities of coal dealt with are large, and a revenue of about £14 per million cubic feet of gas results. This revenue may be easily reduced by a third or more, if the conditions for complete recovery are not constantly fulfilled. It is quite easy to so regulate the working that, even with apparently insufficient washing, the yield indicated may be obtained.

These remarks may perhaps help to elucidate the question of how far the nitrogen of the coal is available, and to attract proper attention to the points indicated.

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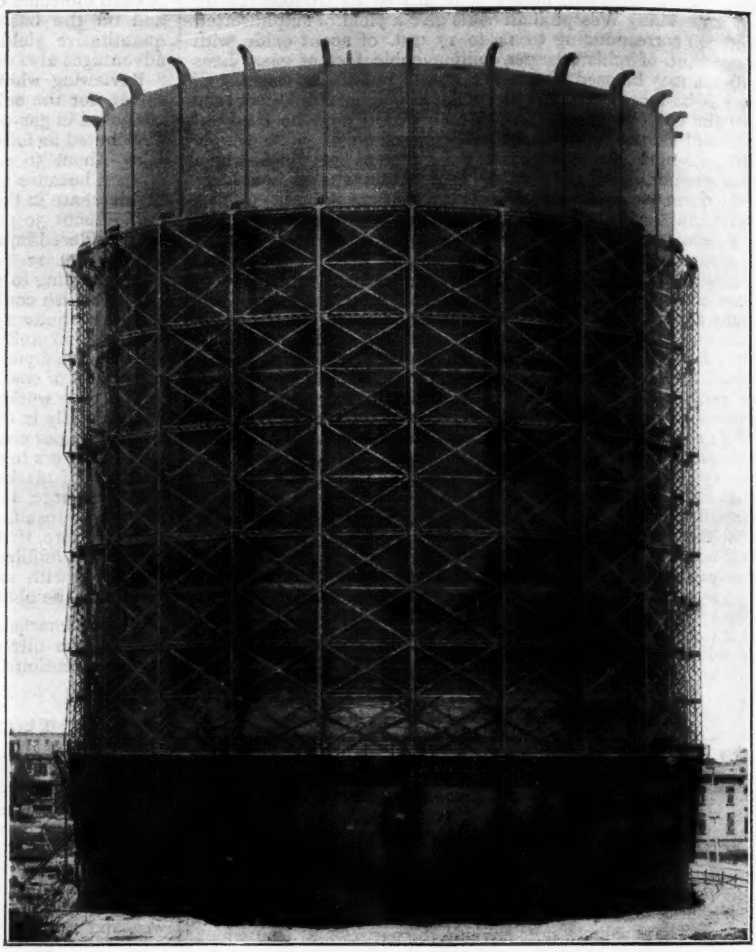
**A Gas-Well in Ontario.**—Citizens of the town of Windsor, in Ontario, Canada, have sunk a gas-well about 1000 feet deep, from which a strong flow of gas was secured; the pressure being 400 lbs. to the square inch. The well was then passed over to the town, which now owns it entirely; the stockholders being paid back the money they risked in the first place to put down a test well. In due course, the town purchased the pipes laid in the streets, and all the other plant owned previously by the Ontario Natural Gas Company, laid down also extra piping where needed, and made preparations to connect with the town well and supply the citizens direct.

**The City Finances of Dublin.**—The *Sunday World*, a paper lately started in Dublin, presented to its readers last Sunday a few comments on the finances of the city, accompanied by some timely criticisms as to municipal doings. The leader-writer characterizes the prospect for the citizens as "gloomy," and he "wonders how many additional pennies in the pound must be squeezed out of the pockets of the Dublin ratepayers, before they realize the gravity of what is taking place in the Corporation." Dealing with the work of the Public Gas Lighting Committee, the writer points out that they "acknowledge a disbursement for legal expenses, arising out of litigation with the Alliance Gas Company, of £1777 10s. 3d., which the City Accountant declares to be £400 less than the actual figure." What was the result of these proceedings? A condemnation by the Master of the Rolls of the meters attached to the public lamps, and an order that they should be replaced by proper ones. Now the Committee want £300 out of the rates, and a loan of £1000, to correct their blunder. "The history of this Committee for the past five or six years," the writer goes on to say, "appears to be a curious one. The number of gas-lamps actually in existence has been reduced to the extent of some hundreds by the lighting of the principal thoroughfares with electricity; yet the annual cost of the department shows an increase of £2000 or £3000 a year during the last five years, while quite £25,000 has been absolutely thrown away. A sum of £14,000 was raised on loan to purchase from the Gas Company lamps and lamp-posts twenty or thirty years old, of which the Corporation had previously the use without any charge whatever. The sums spent in the purchase of the condemned meters and the endless and unsuccessful litigation with the Gas Company amount to several thousands. This department is responsible for heavy additions to taxes for several years past, and continues the same course unchecked." The writer thinks that possibly two or three years of the present methods of running up the city debt, and the yearly rates and taxes will arouse even the ratepayers of the City of Dublin; and when this has been done, possibly an Association will be formed to look after their interests. The *Freeman's Journal*, referring to the litigation between the Company and the Corporation, says: "The city ratepayer has to pay the tight little bill of £1670 to the Gas Company as taxed costs for the recent litigation. The Corporation's own costs cannot be much less; and over £3000 has been thrown away in a legal tussle which could have been easily avoided. This is the way the money goes under existing municipal dispensations. No wonder there is a 6s. rate to be paid next year."

## THE LARGE HOLDER OF THE NEW YORK AND EAST RIVER GAS COMPANY.



In the JOURNAL for April 24, 1894, we reproduced from *Progressive Age* some particulars in regard to the works constructed by the East River Gas Company—an undertaking supplying Long Island—for sending gas to New York City by means of pipes laid in a tunnel under the river. The description of the works was furnished to our contemporary by Mr. D. L. Hough, who was the Company's Engineer. One of the principal features of the scheme was a large gasholder, of 5 million cubic feet capacity, the inner lift of which was to be unsupported by guide-framing. Its design and erection were entrusted to Messrs. R. D. Wood and Co., of Philadelphia, who duly carried out their contract. As the holder is the first of any magnitude built in America on the principle introduced by Mr. G. Livesey in England, we give an illustration of it when fully inflated, with a few supplementary particulars taken from a recent issue of our American contemporary.

The general dimensions of the holder are as follows: Inner lift, 179 ft. diameter and 48 ft. 6 in. deep; second lift, 182 ft. diameter and 49 ft. deep; third lift, 184 ft. 6 in. diameter and 48 ft. 6 in. deep; outer lift, 187 ft. diameter and 49 ft. 2 in. deep. The tank, which is of steel, is 190 ft. diameter and 49 ft. 6 in. deep. It is one of the largest of its kind in the world. The guide-framing is composed of twenty-four standards, 148 feet high, and five tiers of latticed girders. Four 36-inch connections have been provided for the inlets and outlets. The top of each standard carries a guide for centring the rollers of the inner-lift goosenecks, both on leaving as the crown rises above the frame, and on re-entering as the holder descends. Each lift is guided at forty-eight points on the bottom curb, and at twenty-four points on the top curb. The inner-lift goosenecks carry radial rollers only, while those of the other three lifts carry both radial and tangential ones. The inner lift is provided with twenty-four friction plates, opposite the goosenecks of the second lift, each consisting of a bar of channel-iron secured to the leg by bolts passing through the shell. Twenty-four flat friction-plates are bolted to the legs and shell of the second lift. The cups and grips are 21 inches deep and 10 inches wide, excepting the inner lift cup, which is 12 inches wide. Each cup is provided with four of Matton's patent interior overflows (a device which has been already described in the JOURNAL) to prevent water overflowing the grip, and forming ice on the shell. The crown is spherical, having a rise at the top of 10 feet above the curb; and it rests upon a wooden support when the inner lift lands on the tank bottom. The latter is $\frac{3}{8}$ inch thick, and the shell $1\frac{3}{8}$ inches thick in the lower course, tapering to $\frac{7}{16}$ inch in the top one. The largest rivets are $1\frac{1}{2}$ inches in diameter. The plates in the same course are joined to each other by double-butt straps, and to adjoining courses by single-riveted lap-joints.

The tank rests upon a concrete foundation; the space under the bottom plates being filled with a cement grouting run through holes in the plates after the bottom was lowered upon the foundation. The top of the tank-shell is stiffened by a horizontal plate-girder 48 inches wide, which serves as a walk round the tank; extension plates being placed at the back of each standard to permit passage. The outer flange of this walk is braced to the shell of the tank. Upon filling with water, the tank was found to be perfectly tight; and it has not been necessary to touch either joints or rivets with a caulking-tool at any time since filling. The top curb of the tank is reached from the ground-level by a stairway, which continues to the top of the guide-framing.

When the holder is fully inflated, the crown is more than 40 feet above the top girder, and is reached by means of a chain-ladder kept taut by a weight on its lower end, working in guides. When the holder is filled with gas, the crown is 240 feet above the level of the ground.

## THE NEW WORKS OF THE DANISH GAS COMPANY.

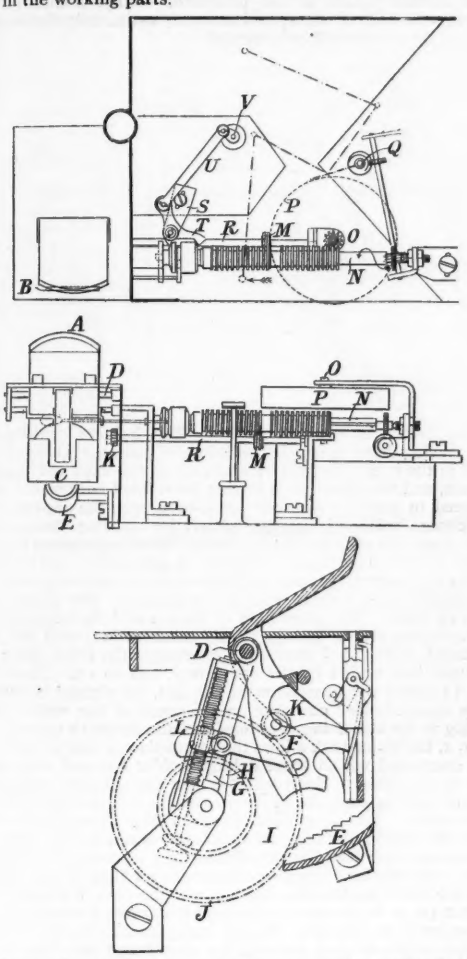
We learn from Mr. F. D. Marshall, the Engineer of the Danish Gas Company, that their new works at Copenhagen, referred to in his paper read at the meeting of the Incorporated Institution of Gas Engineers in May last,* have lately been started. They present a striking example of expeditious construction. The foundations and levelling were commenced only in March this year; and gas was sent out on the 14th inst. We are informed that the works have been excellently built; the brickwork being simply perfection. Native labour was employed upon the buildings. The work carried out in the short space of time above named includes levelling, draining, road making, and paving; two miles of 24-inch main connecting the old works with the new ones; automatic coal-store, briefly described in Mr. Marshall's paper; retort-house fully equipped with inclined retorts to produce $1\frac{1}{2}$ million cubic feet of gas per diem, elevators, coal-hoppers, &c.; automatic coke elevator and railway (the coke being received in trolleys, elevated, and tipped without being touched by hand); the largest Monier tar and ammonia tank yet constructed; the most modern types of engines and exhausters, patent battery condensers on the Marshall-Reutter system, "Standard" washers, and Marshall tar extractors (all under cover); a 170-feet artesian well, water-tanks, and Steinmüller water-tube boilers; purifiers fitted with automatic filling elevators; automatic oxide-revivifying apparatus; station meters, automatic station governor adjusting the town pressure in direct ratio to the consumption without the aid of clockwork; Bunte's benzol apparatus for carburetting in bulk; spirit vaporizer for adding spirit vapour to the gas in bulk to prevent frozen pipes in winter; overground steel gasholder tanks; stores, offices, Manager's house (all centrally warmed by Perret's slow-combustion dust-fuel furnaces); testing works; caustic and sulphate of ammonia works (Grüneberg and Blum's system); baths for workmen, &c. The contracts were distributed among various nations; the Company going to the very poles for machinery and ideas. England has contributed gasholders, purifiers, and pipes, &c.; Germany, retort-ovens, elevators, roofs, and flooring; Italy, paving for the engine-room, flooring, &c.; France, gauges and clockwork apparatus; Denmark, bricks, cement, and labour; Norway, all the timber; and Sweden, all the paving tiles, &c. It is gratifying to find that the Directors allowed Mr. Marshall free scope and unlimited means for carrying out his ideas; and the result has been the production of works of which all concerned may be justly proud.

* See JOURNAL, Vol. LXV., p. 1245; also Vol. LXVI., p. 176.

# REGISTER OF PATENTS.

**Prepayment Gas-Meters.**—Sutherland, A. G., of Kennington, and Stidder, J. G., and Everett, J. F., of Stamford Street, London, S.E. No. 22,457; Nov. 20, 1894.

This invention relates to further improvements in the prepayment gas-meters described in patent No. 8981, of 1894; the object being "to improve that part of the mechanism by which the amount of gas to be obtained for the coin is determined, and to effect other improvements in the working parts."




The illustrations are a plan, an elevation, and a sectional side view (on an enlarged scale) of parts of a dry gas-meter made in accordance with the patentees' proposal.

A is the handle or lid, shown raised for the receipt of a coin; but when depressed, the coin-slot B is covered. The coin when inserted falls into the cradle C. The cradle is pivoted at D; and it retains the coin, resting upon the highest step of the fixed plate E, until the handle is moved, so as to cause the coin to push backwards the lever F, also pivoted at D, until the coin falls behind the plate E. The lever is coupled by a link with the lever G, carrying a guide block and nut threaded on a regulating screw-spindle; the position of the travelling nut regulating the throw of the lever. The lever is integral with a lever H, carrying a pawl in gear with the ratchet-wheel I; the latter being integral with the toothed wheel J. This wheel is fitted with a spring impinging against both the wheel and the case, and acting as a friction brake to absorb the momentum of the wheel, and prevent its rotation beyond the regulated angle of advance. The wheel gears with a pinion K. By means of a milled head and the regulating-screw, the radial distance of the block L can be reduced or increased, and the angular movement of the wheels I J correspondingly increased or diminished. This movement of the latter wheel causes the pinion K to rotate a certain number of times. The pinion K is fast on a spindle, which also carries a worm M fast thereon. N is another parallel spindle, carrying a sleeve having a worm and an annular toothed rack formed thereon. The rack is in gear with a pinion mounted on the shaft O carrying the drum P. The sleeve is capable of sliding longitudinally upon the spindle N, and is carried round therewith by means of a pin or feather fitted to the sleeve, and running in a groove formed in the spindle.

The motive power for returning the drum and apparatus to zero is obtained by a worm attached to the crank-spindle Q, which drives a pinion and spindle. By means of a worm fast on this spindle, the pinion fast on the spindle N is driven in the direction of the bent arrow; and the rotation causes the sleeve to rotate. While the spindle is rotating, the spindle R is held stationary by a pawl, ratchet-wheel, toothed wheel, and pinion. The worm M then acts as a nut to the rotating worm, which is driven with the sleeve in the direction of the arrow. S is a fixed adjustable bracket; and T is a forked lever pivoted to S, and linked to the rod U. The forked lever is operated by its contact with the conical surfaces forming part of the sleeve. By this arrangement, the gas is cut off at V, when the sleeve has arrived at the end of its travel in the direction of the arrow; and the gas is turned on by the contrary movement, obtained by the primary movement of the handle A.

The operation of this arrangement is as follows: The handle A is raised preparatory to the insertion of a coin. This movement uncovers the slot, and pulls back the lever F, by means of the bar attached to it. The coin is then inserted in the slot B, and, falling into the cradle C, is then in position to operate the lever F, which is effected by moving the handle downwards. The lever is provided with a projection for contact with pennies; and another projection for contact with half-pennies. The movement of the lever operates the lever G, and with it the pawl-lever H, whereby the ratchet-wheel I and toothed wheel J are caused to partially revolve, thereby rotating the pinion K and worm M. The rotation of the worm causes the sleeve to move towards the right, whereby the drum P is partially rotated, so as to indicate the amount of gas to be obtained on prepayment. The apparatus is then free to supply gas until the sleeve is returned to its normal position, as previously described.

In order to limit the number of coins inserted, and the revolution of the drum P to less than a complete revolution, a rod, fitted with a fork working in a groove formed in the sleeve, is carried by the fork to and fro with the sleeve. The rod is fitted with a cone, which remains idle until the greatest amount of gas available by the rotation of the drum has been paid for and unconsumed. The cone is then carried into contact with an arm attached to a trigger, pivoted so as to cause the bar to stop the slot B, and prevent the further entrance of coins until gas has been consumed. The trigger also performs the function of blocking the slot while a coin is in the cradle.

**Conveyors and Elevators.**—Hunt, Charles, of Birmingham. No. 46; Jan. 1, 1895.

This arrangement of conveyors and elevators and their parts has been designed "for the purpose of simplifying their construction, so as to reduce wear and tear and minimize the weight of the parts, and further to provide for the rapid and cheap exchange of those parts which are the most liable to rapid wear, as also for such wear." This is especially necessary, says the patentee, for conveyors and elevators used for the transmission of coke or its refuse, as the constant grinding and friction are excessive.

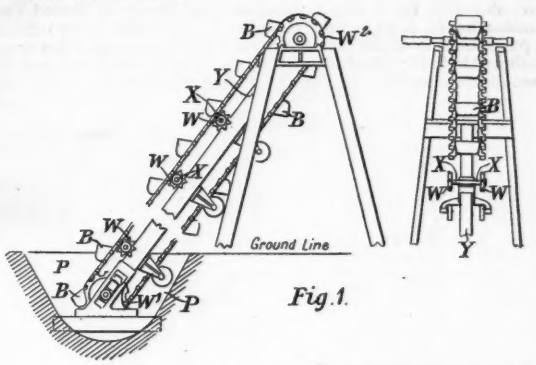



Fig. 1.

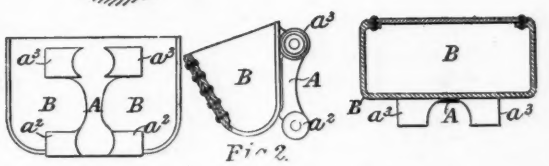



Fig. 2.

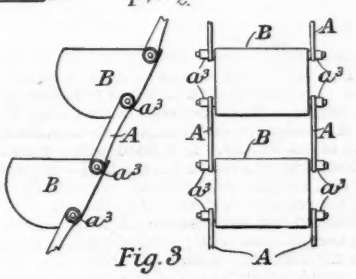



Fig. 3

Fig. 1 shows a side elevation and a front elevation of the invention applied for elevating coke or other matter from the recesses or pit P; also showing the sprocket-wheel W supported by the axle X on the centre-beam Y. To the elevator, buckets B are fastened; each having two links attached to it by rivets or bolts. The connecting-links A are formed with a journal $a^2$ at one end, and a socket $a^3$ at the other. The pin portion $a^2$ enters $a^3$, and forms the joint; so that all the wear and strain are taken up by the links themselves. The links may be cast upon the buckets B either at the end, or a double or single one at or near the centre, as shown in fig. 2. On the other hand, a very simple elevator may be constructed by forming projections on each side of the buckets B, as in fig. 3, when it is only necessary to pass over the links A with (in this case) their double sockets—that is, a socket $a^3$ at each end—when the whole are seamed together by a pin passing right through the buckets and studs, and links or short bolts or pins may be used. But even in this case, the wear and strain are not upon the pin or bolts. Even in the case of fig. 3, there may be any number of intermediate links A used, so as to make the buckets any pitch. The sprocket-wheels W and $W^1$ have hollows, into which the sockets $a^3$ of the links take, thus avoiding unduly sharp teeth, which are liable sometimes to foul.

In fig. 1, either the wheel $W^1$ or $W^2$ may be driven; but the

patentee makes no claim to the mode of driving. It is evident that the webs and other parts of the links A may be formed to any sections and configuration, to serve any particular purpose for which they may be required. In the case of conveyors, the receptacles may be made from flat or dished plates with side flanges only, or both side and end flanges; and these may be secured to the links (such as $A^1$), or links may be formed on their ends or underneath.

**Producing Carbide of Calcium.**—Gearing, E., of Harrogate. No. 1807; Jan. 25, 1895.

The claims for this invention—which is for a modification of the arrangement illustrated in the JOURNAL for Jan. 15 last, p. 120—are: (1) An electric furnace for producing carbide of calcium, constructed with a moveable electrode, and means for causing it to travel within the melting chamber in such a path as to change the position of the arc in relation to the vertical axis or centre of the melting chamber, in order that the material in the chamber may be the more effectually and completely acted upon. (2) An electric furnace for producing carbide of calcium, in which an electrode and a feeding-hopper for supplying the material to be treated are arranged to travel, one in advance of the other, around within the melting chamber.

**Incandescent Lighting Burners.**—Oehlmann, E. H. C., of Berlin. No. 13,467; July 12, 1895.

The claims for this invention are: (1) A burner for incandescent lighting, having a rod which hangs from the top of the burner into the mixing chamber, designed to heat the mixture of gas and air passing through the chamber before it reaches the point of combustion, for the purpose of increasing the efficiency of the light. (2) In a lamp for burning volatile liquids—such as spirit, benzene, and the like—the combination of the burner described in claim 1, with one or more vaporizers heated from the exterior, and provided with wicks, which (for the purpose of facilitating the passage of the vapour formed in the same to the mixing chamber) are pierced with passages or tubes longitudinally.

**Incandescent Gas-Lamps.**—Farcas, A., of Paris. No. 14,404; July 29, 1895.

As shown in fig. 1, this incandescent gas-burner is formed by the combination (1) of an annular chamber A, connected by two conduits or passages B $B^1$ to the tube or nozzle C for the supply of gas or other combustible fluid; (2) of a casing surrounding the chamber, and rising some distance above it; and (3) of a central passage or conduit E, which

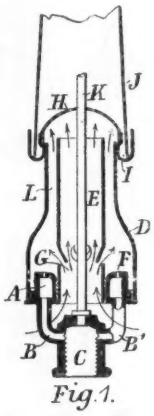


Fig. 1.

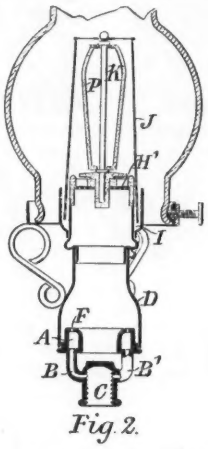


Fig. 2.

serves for the distribution and control of the air circulating through the burner. The upper edge of the chamber A has in it perforations F, the number of which must be sufficient to ensure an ample supply of gas to the burner. The upper edge of the casing D is adapted for the reception of a perforated diaphragm or sieve H, affording a passage for the mixture of gas and air. It is fitted with a groove or channel I, wherein the lower edge of a sleeve J is retained—the stationary central rod K serving as a support for the sleeve. An annular space L is provided between the casing D and central passage E.

The gas conducted into the chamber A is distributed in quantities, determined by the perforations F; while the gas in the annular space L mixes with the air admitted through the orifice G. The mixing of the air and gas is completed at the top of the burner, underneath the perforated plate H, under the action of the air arriving through the central passage E; and its escape takes place without any risk of the mixture becoming ignited within the casing.

The arrangement may be modified as shown in fig. 2. The central passage E is here omitted; so that the air and gas mix in the casing D direct—the mixture being more thorough than in the other arrangement. The circulation of air is also more active; and the flame, "though obtained at less expense, is productive of more heat than those of other burners." The burner $H^1$, which surmounts the casing D, is in its turn surmounted by a cone P, of porcelain or other fire-proof material; the object being to increase the heat yielded by the burner. The cone, on being heated to incandescence, both by contact and radiation, heats the mixture of air and gas which comes in contact with it, "thereby producing a light far more intense than it would otherwise be, all the more so because the cone P acts as a reflector of light."

**Decomposing Carbide of Calcium.**—Gabe, H., of Copenhagen. No. 17,746; Sept. 23, 1895.

This apparatus for decomposing calcium carbide for the production of acetylene, is shown in two forms—fig. 1, a small apparatus; and fig. 2, an apparatus for generating larger quantities.

In fig. 1, A is a water-container, having a gas-outlet tube rising centrally through its bottom, and controlled by a stopcock. D is a gas-bell immersed in the water, and provided with a central guide-tube having gas-exit orifices at the upper part, and sliding easily upon the gas-outlet tube B, whereby the bell is guided. The crown of the bell is surmounted by (say) two cylindrical charge chambers G opening into the bell, and closed at the top by screw-caps. Within each chamber, a cylindrical holder is suspended to the hooked end of a slide-rod, passing through a stuffing-box and gland on the screw-cap H. The charge holders are perforated to admit the water to the calcium carbide packed in the perforated charge holder in layers alternated with discs of waterproof material, so that only the immersed portions of the charge will be saturated.

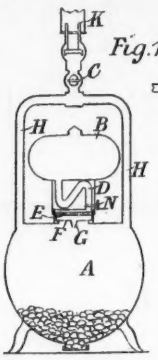


Fig. 1.

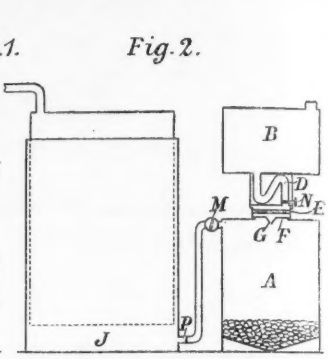


Fig. 2.

The apparatus is used as follows: The holders containing the carbide having been suspended within the chamber G by the rods retained in the raised position by screwing on the caps and tightening the glands, and the container A having been filled with water and the bell placed in position with the guide-tube upon the gas-tube B, one of the charge holders is lowered slowly by slacking the gland, and pressing down the suspension rod, so that the charge comes in contact with the water. Thereupon acetylene is generated; and the bell is raised by the internal gaseous pressure—the charge being meanwhile continually lowered until it will go no farther. The gland is then screwed up tight. The generation of the gas will thereupon continue at a rate corresponding exactly to the consumption, until the charge is exhausted, and the bell descends; whereupon the other charge must be brought into action in the same way, and so on. Should it be desired to arrest the generation of the gas, the charge is drawn up into the charge-holder chamber out of reach of the water; the gas remaining in the bell being consumed and the stopcock closed.

In fig. 2, the water-tank allows the immersion of one or more bells, having suspended within them a large holder charged with calcium carbide as described. Each bell has two gas-delivery pipes R S—the former leading from the upper part of the bell, and the latter from near its mouth. The pipes have stopcocks kept closed while the bell is being immersed; and they are coupled by screw unions to branches of a common delivery-pipe, provided with a stopcock V between the branches, and leading through a condenser and filter to a gasholder.

Both the lower cocks being opened, and the cock V connected with the holder (so as to be opened whenever it assumes a certain position), the operation is as follows: The air being forced out of the bell, the water rises within it; and on reaching the charge, the decomposition of the lowest layer of calcium carbide takes place. The holder having risen to a certain height, the cock V will be closed automatically; but the calcium carbide saturated by water will continue to be decomposed and generate acetylene gas, forcing the water out of the bell, so that any surplus of gas will pass out to the holder through the pipe S.

**Incandescent Gas-Lamps.**—Voelker, W. L., of Elizabeth (N.J.), U.S.A. No. 17,795; Sept. 24, 1895.

The patentee proposes to construct the frame or carrier of incandescent gas-mantles of porcelain or a porcellanous compound, which, when baked, has considerable strength, and to add to the frame "in any suitable manner—as by impregnation or incorporation therewith—an incandescing substance, bringing the hood to a hard and refractory condition by baking."

One method of producing the hoods is as follows: 60 parts of kaolin, 20 parts of quartz, and 20 parts of feldspar by weight, are ground to an impalpable powder and mixed; and an equal weight of saturated solution of sugar syrup is then thoroughly mixed with the mass. From the mass threads or filaments "of great tensile strength" can be made in any suitable manner—as by drawing in a die. The filaments can be formed into hoods by weaving, knitting, or other such mechanical operations, to produce the desired shape of the structure, which is then thoroughly dried and baked at a high temperature in an oven. After this, it is dipped in a saturated solution of salts of the metals which are to be used for the incandescing properties. The hoods are then oxidized by the proper chemical agents, heat, or electricity. A modification of the foregoing process consists in incorporating the oxides with a porcellanous material while the latter is still in the powdered state; and the saccharine matter is added at the same time. In this case, 20 per cent. of the porcellanous material, reduced to an impalpable powder, is combined with 45 parts of light oxide of magnesia, 10 parts of zirconia oxide, 5 parts of chromium oxide, and 20 parts of dense sugar syrup by weight. These materials are thoroughly mixed and reduced to a mass of the consistency of putty. Threads or filaments can be formed of this mass as before stated; and the threads or filaments may be woven or otherwise combined into suitable hoods or mantles, which are then thoroughly dried and baked, when they are ready for use.

The basis of the invention consists in the forming of a frame or carrier of porcellanous material, to sustain the metallic oxide which constitutes the incandescing agent. The porcellanous carrier gives

tensile strength to the hood, and is the vehicle for holding the incandescing particles—in other words, "the porcelain biscuit (which is to say the porcellanous carrier) being a porous body, is rendered more porous or cellulous by the oxidizing of the saccharine matter." In the first process described, "the porous framework has its coral-like structure sufficiently covered with myriads of small crystals of the oxides or salts of the metals, which are held there first by chemical means, then again when baked by mechanical means. In the second process, the porcellanous structure is still the framework; the chemical combination, under the influence of heat, taking place just the same. But in the latter process, it is modified by the incorporation of the oxides of magnesia in such a manner that the shrinkage is not so great at a given temperature." But after numerous experiments, the patentee claims to have demonstrated that the final result is approximately the same in both processes in respect to light-giving qualities.

## APPLICATIONS FOR LETTERS PATENT.

23,577.—ARMSTRONG, F. W., "Incandescent gas-burners." Dec. 9.
23,610.—FOX, J. R., "Taps or valves for water and other fluids." Dec. 10.
23,639.—BIRNBAUM, T., "Burning illuminating gas." Dec. 10.
23,646.—GLOVER, R. T. & J. G., "Gear for coin-freed apparatus for the sale of gas." Dec. 10.
23,652.—ASQUITH, J., "Gas-burners." Dec. 10.
23,661.—STEVENS, G., "Appliance to indicate and localize stoppages in water-pipes and cisterns, and to prevent freezing and bursting of pipes, and explosions in kitchen boilers." Dec. 10.
23,712.—BEALE, A., "Gasholders." Dec. 10.
23,735.—MILNE, J., and O'CONNOR, H., "Gas-governors." Dec. 11.
23,736.—MILNE, J., "Dry gas-meters." Dec. 11.
23,737.—MILNE, J., "Gas-governors." Dec. 11.
23,738.—MILNE, J., "Valves for gas, steam, water, or other fluids." Dec. 11.
23,752.—HUGHES, E. T., "Safety gas-burner." A communication from B. Smith. Dec. 11.
23,763.—LOEWENBERG, G., "Incandescent gas-burners." Dec. 11.
23,768.—BROUWER, J. DE, "Burner and appliances for supporting incandescent gas mantles." Dec. 11.
23,770.—BROUWER, J. DE, "Conveying incandescent coke from retorts in gas-works, extinguishing same during its passage along the apparatus, and screening the coke and piling up, storing it, or discharging it into waggons or other receptacles." Dec. 11.
23,856.—DENAYROUZE, D., "Production of poor combustible gases with or without enrichment, and the application thereof for combustion in Bunsen and incandescence gas-burners." Dec. 12.
23,909.—WITTE, W. R., "Glass chimneys for gas-burners with movable flat glass blades or movable glass rods." A communication from H. D. Grange. Dec. 13.
23,955.—LEE, J. W., "Gas-carburettor." Dec. 13.
23,957.—TOMLINSON, H., "Gas lighting appliances." Dec. 13.
23,989.—HERRING, W. R., and GRAHAM, M., "Charging inclined retorts." Dec. 14.
24,008.—BARRIÈRE, P., "Preparation and production of bodies for use in incandescent gas lighting." Dec. 14.
24,012.—SCHOONJANS, G., "Gas heating apparatus." Dec. 14.

**Dissatisfaction with the Proposed Water Board for West Kent.**—At the meeting of the Bexley District Council last Tuesday, the Clerk produced for signature the petition for the Kent Water Bill. Thereupon Mr. Cottell objected to the way in which the matter had been brought forward, and contended that the Council would not gain anything by joining in the movement for the establishment of a Water Board, but would be saddled with a share of the expenses. He said they already had the purest supply of water in the Metropolitan area; and he saw no necessity for the Bill. Mr. Lucas moved that the petition be signed; but Mr. Cottell proposed an amendment to the contrary, and it was carried.

**Gas-Stoves in Bedrooms.**—The Rev. W. E. Hurndall, M.A., and Mrs. Hurndall, residing at St. Ermin's Mansions, Westminster, had a narrow escape from being suffocated by gas on the night of Saturday, the 14th inst. It appears that they were in the habit of using a small gas-stove in their bedroom, for the purpose of heating water; and it is presumed that, on retiring to rest on the night in question, the stove was extinguished, but that the gas was not effectually turned off, and was escaping all night. Nothing being seen of Mr. and Mrs. Hurndall during Sunday, inquiries were instituted, with the result that in the evening they were found lying in an unconscious condition; their room being strongly impregnated with gas. Mrs. Hurndall speedily recovered under restoratives. But all efforts to resuscitate her husband were long unavailing; and he remained insensible till about midday on Tuesday. His medical advisers expressed the opinion that his prolonged unconsciousness was owing to a weak heart. Mr. Hurndall is a minister attached to the Westminster Congregational Chapel.

**The Lighting of Falmouth Streets.**—Some months ago, the Falmouth Gas Company placed incandescent burners in some of the lamps in Market Street, the principal thoroughfare, to show the advantages of street lighting on that system. At a meeting of the Town Council on the 14th inst., it was proposed that incandescent burners should be also applied to the lamps in Church Street. This led to a general demand for the system in all parts of the town. Mr. T. Webber said he was convinced that, if the Lighting Committee considered the merits of incandescent lighting, they would recommend its adoption throughout the borough. Penzance had saved rather more than one-third of its gas bill by the use of incandescent burners; and Falmouth might also save money and have a better light. Mr. Grose suggested that the Gas Company should be asked to provide the burners free of cost, as had been done at Truro. Mr. S. Collins said the cost would be £450. Mr. W. W. Phillips remarked that, though the saving would be great, the initial cost had to be considered; and before going into this the Council should settle whether they would buy the gas-works. It was decided to refer the matter to the Lighting Committee, together with a suggestion that the street-lamps should be lighted every night, whether there is a moon or not.

# CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

### The Prices of Ammoniacal Liquor and Sulphate of Ammonia.

SIR,—Having ventured to criticize your late reports of the chemical market, I deem it a duty to add how fully I agree with your statement in the foot-note to my recent letter—that the only market reports possessing any value have been those appearing in the JOURNAL. You will also I hope allow me to add that I readily admit that, since their first appearance in 1884, they have been markedly reliable. It is solely against the ratios appearing during the last few months that I ventured to make my appeal. So representative of market movements have these reports been, that I have quite recently suggested the ratios of the last three years as a basis for future business; the last three years being selected on the simple ground that the processes of manufacture have remained fixed during those years.

The scale suggested was based on the following references to your chemical notes: During May, September, and October, 1894, you quoted the price of sulphate as being about £13 per ton, and liquor at 9s. to 11s. per ton. During the months of March, April, and May, 1893, you quoted sulphate at £12, and liquor at 8s. 6d. to 9s. 6d. per ton. In February, 1893, in December, 1894, and during January and February, 1895, you quoted sulphate at about £11, and liquor at 6s. to 8s., or 6s. 6d. to 8s. 6d. During the whole year 1892, you gave the value of sulphate as about £10, and of liquor at 6s. 7d. On May 31 and June 21, 1892, you quoted sulphate at £9 12s. 6d., and liquor at 5s. to 6s. The point of my criticism "lies just here"—that to-day sulphate having fallen still lower than this former "lowest on record," or to £8 11s. 3d., the price you quote for liquor is, not 4s. per ton, as the scale of all former years would suggest, but the value is given at 7s. to 8s. per ton. This I venture to characterize as an impossible ratio.

I should be sorry to conclude without acknowledging that I heartily admit the benefit these reports have conferred on all connected with the purchase and sale of gas residuals, by replacing long-dated contracts by reasonable commercial valuations. By your reports, you have relieved the chemical manufacturer of one of his most anxious duties, Long contracts, made at times of high prices, were simply gambling speculations, which often resulted in serious losses. While recording my gratitude for this valuable assistance, I ask to be permitted to hope you will continue to render the same service to both gas proprietors and the purchasers of residuals.

H. C. BROWN, Ph.D., F.I.C.

*King's Lynn, Dec. 19, 1895.*

### The South-West of England District Association of Gas Managers.

SIR,—Having acted as Secretary of this Association for the last ten years, and attended every Committee meeting, and (with one exception) all the other meetings, I can claim a fairly intimate knowledge of its affairs, its present position, and the reasons which have guided the decisions of the Committee. But many things have been published concerning it, as a consequence of the so-called discussion of a certain proposition at the recent meeting of a neighbouring Association, that are quite new to me, and had it been possible to read them with titles and local references cut out, I should never have recognized the "South-West."

The unfortunate suggestion which has been so curtly received by you and by some of the leading lights of the other Association, emanated from members of both. It was discussed by my Committee as a question of mutual advantage. Such a subject as the possibility of a total breakdown in the progress of the South-West, or of disbandment has never suggested itself. There is no reason why it should. The membership is as good as ever it was; there is plenty of money in hand; papers have been promised; and invitations for meetings received. It was thrown out by a gentleman in the course of the proceedings just mentioned, who has no connection whatever with the South-West, and seems to have been largely concerned in furnishing the text for your remarks, which, like the "discussion" in question, tend to stray from the original point to matters concerning this Association only.

It has been a matter of common knowledge for years that the good attendance at the Holborn Restaurant is largely due to convenience of access. If the company was confined to members within driving distance, the muster would scarcely be small. You suggest Bristol as a good centre for the South-West. It is probably the best which the district affords. But how many of the members could get there in an hour? This is the point that tells against our attendances, and not apathy on the part of the members.

My Committee were informed, on reliable authority, that the proposition would not be unfavourably received; and had they been aware of the change of front exhibited at the recent meeting, I do not believe they would have made it. Certainly they did not anticipate that one result of their action, which was entirely innocent and in good faith, would be the holding up of their Association as an "awful example" for the good of the others, all of whom are acquainted, to a greater or less degree, with the difficulties which we have candidly admitted.

N. H. HUMPHRYS.

*Salisbury, Dec. 20, 1895.*

### The Extensions at the Plymouth Gas-Works.

SIR,—In your last issue, I find that Mr. Townsend is endeavouring to show that you have made some mistakes in your remarks on the affairs of the Plymouth Gas Company; and he appears to be very desirous that everything in connection with the Company should be accurately stated. For my part, I also am especially anxious that the whole truth should be known.

It is quite true that the shell of the retort-house and coal-store, &c. were designed and contracted for before I was requested by the Chairman of the Company to prepare plans for the internal work of the retort-house; and I did prepare these drawings, and eventually carried out the work. I also arranged that the roof of the coal-store should be designed so that it would carry the conveying plant, and prepared designs for other parts of the apparatus.

In your remarks upon the statements made by the Secretary of the

Company on the evening of Dec. 5, it was pointed out that the Plymouth Gas Company, like most other gas companies, had been in trouble in connection with the high prices of coal and labour; and that from 1890 to 1893 inclusive they were fortunate in having an undivided balance to fall back upon, from which upwards of £8000 had been taken, and which enabled them to pull through without increasing the price of gas. But Mr. Townsend appears to object to this statement; and he endeavours to correct it. He is very desirous to make out that he has done more than it was possible for any other engineer to do, and meet all these difficulties without taking anything from the reserves. (He must have inspired some remarks upon this subject which appeared in your issue of the 22nd of January of this year, p. 163, which are untrue, but which were allowed to pass at the time.) The facts will show that he has not done any more than, and perhaps not so much as, other engineers might have done similarly placed; and why he should make such misleading statements, when the facts were ascertainable and ought to have been within his knowledge, is beyond my comprehension.

The Secretary prepared for me a detailed statement of the working for the four years referred to, when I had to deal with the re-assessment of the Company's works. Some of the figures I will lay before you. On March 31, 1890—

| | |
|---|---|
| The reserve fund stood at . . . . . | £14,736 15 7 |
| The increase upon this amount for the last five years arises entirely from the increment of interest, and has nothing whatever to do with the working or reserve account, amounting to. . . | 2,425 16 6 |
| Mr. Townsend is therefore certainly not entitled to take credit for this amount in the ordinary working of the concern . . . . . | £17,162 12 1 |

The figures in the yearly accounts from 1890 to 1893 are as follows:—

| | Revenue Account. Profit. | Dividend. Amount Required. | Deficiency, taken from Undivided Balance. |
|---|---|---|---|
| March 31, 1890 . | £8169 0 10 .. | £9,887 10 0 .. | £1718 10 2 |
| March 31, 1891 . | 6439 12 6 .. | 9,887 10 0 .. | 3447 17 6 |
| March 31, 1892 . | 8777 18 4 .. | 10,118 15 0 .. | 1430 16 8 |
| March 31, 1893 . | 8450 7 3 .. | 10,696 17 6 .. | 2246 10 3 |
| Total taken from the undivided balance during the four years to make up maximum dividends . | | | £8843 14 7 |

During the last two years, the Chairman and Secretary, who always purchase the coals and attend to the commercial part of the undertaking, have, as in the case of most other companies, obtained a considerable reduction in the price, which has helped to meet the dividends and increase the undivided balance, which, after paying the half year's dividend, stood on March 31, 1895, at £17,577 os. 6d., and not at £23,908 15s. 8d., as stated by Mr. Townsend.

Again, Mr. Townsend is not entitled to take all the credit for the working of the year ending March 31, 1895, as my stoking machinery and the regenerator furnaces and other labour-saving appliances were at work for fully six months out of that year. These brought about the savings which enabled the Company to pay full dividends upon a capital which had recently been doubled owing to the extensions that had been carried out; and these profits would have been more but for the recent unfortunate reduction in the price of sulphate, amounting to £12,000.

*Manchester, Dec. 21, 1895.* JOHN WEST.

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SIR,—Without wishing to criticize the report of the proceedings in the JOURNAL for the 10th inst. of the inauguration of a new gasholder at Plymouth, and its inaccuracies, and knowing as I do the inner working of all matters concerning the undertaking, both of the past and present, I do not care to use your JOURNAL for anything that may possibly appear personal. But as there are persons who are trying to take all the credit for the supplying of the "cheapest gas in the world," I think it only fair that the name of Browning should have a "look-in." Will you allow me therefore briefly to state that my late father occupied the position of Engineer and Manager to the Plymouth and Stonehouse Gas Company for about 34 years, and during that time the whole of the works were remodelled. All the drawings and specifications were made by him (with the help of his sons, who held the appointment of Assistant-Engineer from time to time), and tenders were invited in the usual way.

His policy was (and he was always supported by the Directors) to keep down the capital expenditure and reduce the price of gas at the first opportunity, as any excess in either case only brought worry and trouble for the poor Engineer and Manager, who is, and rightly so, held responsible to his Directors. Consulting Engineers were only employed on parliamentary work when new capital was raised.

*Neath, Dec. 20, 1895.* R. ALEX. BROWNING, Assoc.M.Inst.C.E.

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### Explosions of Domestic Boilers.

SIR,—The letter referred to in the JOURNAL for the 10th inst., as having been received by the Secretary of a Water Company from the Board of Trade, in reply to his inquiry as to what "safeguards" or precautions the Board suggested should be adopted to prevent such accidents as those alluded to in their recent circular, appears to me most unsatisfactory. I think it would be advisable for companies and local authorities supplying water to hesitate before suggesting safeguards to consumers, as, in the event of such suggestions failing to prevent subsequent explosions, litigation would not be improbable.

The reason the Board give for abandoning their idea of issuing a short circular is not easy to understand, as it seems to me that "the varying requirements and circumstances of different districts" consist of two—first, where there is a constant supply; and, secondly, where there is not. Surely the Board of Trade could, without much difficulty, frame a circular to meet each case.

It is obviously undesirable that a number of different suggestions should be made throughout the country, as would undoubtedly be the case if every water company and local authority framed their own.

R. L. S. BADHAM, Secretary,
Provincial Water Companies' Association.

18, *Abingdon Street, S.W., Dec. 21, 1895.*

## LEGAL INTELLIGENCE.

### HOUSE OF LORDS.—Tuesday, Dec. 17.

(*Before the* LORD CHANCELLOR, *Lord* WATSON, *Lord* SHAND, *and Lord* DAVEY.)

**The San Paulo (Brazilian) Railway Company, Limited, v. S. G. Carter (Surveyor of Taxes).**

This was an appeal from a decision of the Court of Appeal reversing a judgment of the Queen's Bench Division, and confirming the determination of the Commissioners for the special purposes of the Income-Tax Acts. The appellants are an English Company formed and registered under the Joint-Stock Companies' Acts; and they have their registered office at No. 111, Gresham House, Old Broad Street, in the City of London. The actual work of the Company is carried on in Brazil, where the profits are earned. But the control of the Company is in London; and the business is carried on under the Directors here. The Directors enter into contracts for, and purchase in England and send to Brazil, the materials for the addition, extension, and improvement of their property, for repairs thereto, and for new plant. The accounts are kept in London, where the balance-sheets, reports, &c., are made out, all meetings are held, and dividends declared and paid. The Directors have appointed a Superintendent, who resides in Brazil, is a salaried servant of the Directors removable at their pleasure, and must obey and execute the orders sent out to him by the Directors from London. In these circumstances, the Income-Tax Commissioners made an assessment of £370,122—the full amount of their profits and gains—upon the Company, against which the latter appealed. In the case stated by the Commissioners for the opinion of the Queen's Bench Division, it was found as a fact that, with an exception of transfer fees, amounting to about £128 per annum, and annual interest upon money, amounting on an average to £1423 yearly, upon both of which particulars income-tax has been paid by the appellants, the whole revenue of the Company arises from moneys earned and paid to them in Brazil for the carriage of passengers, goods, &c., on the San Paulo Railway. The contention on behalf of the Company was that they were not chargeable under the first case (Schedule D, sec. 100, of 5 & 6 Vict., cap. 35) to income-tax on £370,122, the full amount of the balance of the profits and gains of the Company, but are chargeable under the fifth case (Schedule D, in the same section) only upon £295,070, the full amount of the actual sums received in the United Kingdom upon an average of three years. The Queen's Bench Division, consisting of Mr. Justice Vaughan Williams and Mr. Justice Wright, held that the case was governed by the decisions in *The Bartholomay Brewing Company v. Wyatt* (1893, 2 Q.B.D., 499) and *The London Bank of Mexico v. Apthorpe* (1891, 2 Q.B.D., 378); and accordingly the Company's appeal was allowed with costs. The Crown having appealed, the Court of Appeal, consisting of the Master of the Rolls, Lord Justice Lopes, and Lord Justice Rigby, reversed the decision of the Queen's Bench Division, and found that the assessment ought to be made upon the full profits of the Company. The Company now sought to set aside the decision of the Court of Appeal, and to restore that of the Queen's Bench Division. The case is of interest to our readers, as the question raised affects English gas companies carrying on their operations in foreign countries.

Sir E. CLARKE, Q.C., Mr. BIGHAM, Q.C., and Mr. BREMNER appeared for the appellants; the ATTORNEY-GENERAL (Sir R. E. Webster, Q.C., M.P.), Sir R. T. REID, Q.C., and Mr. DANCKWERTS represented the Crown.

Their Lordships delivered judgment as follows:—

The LORD CHANCELLOR: I think one proposition has been conclusively established by the various cases that have come under your Lordships' consideration, and that is that, where the trade is wholly or partially carried on in this country, the trader is liable to pay income-tax on the profits of his trade. Now, in this case the appellant Company is an English Company, residing—so far as that abstraction a corporation can reside at all—in England. It has an office in London; and I am disposed to think (though it is unnecessary for the purposes of this case to say so) that its trade, if the word "trade" is strictly construed, is wholly carried on in England. It seems to me that, as was said by Chief Justice Cockburn and Mr. Justice Crompton in the case of *Sulley v. The Attorney-General* (5 Hurlstone and Norman, 711), "it is probably a question of fact where the trade is carried on," and it is probably true to say that this phrase may be understood in two different senses. It may mean where the goods in respect of which trading is carried on are conveyed, made, bought, or sold; or, speaking of land, where it is cultivated or used for any other purpose of profit. That makes the locality of the goods or the land which are the subjects of the trade to be in a certain sense the place where the trade is carried on, because it is the place where the things corporeally exist or are dealt with. But there is another sense in which the conduct and management—the head and brain—of the trading adventure are situated in a place different from that in which the corporeal subjects of trading are to be found. It becomes, therefore, a question of fact; and according to the answer to be given to the question, "Where is the trade in a strict sense carried on?" will the answer be, under the Income-Tax Acts, "There it is liable to assessment." It is therefore necessary to determine upon these principles where the appellant Company carries on its business. It deals, undoubtedly, with land in the Brazils. In Brazil the payments are received; and in Brazil the passengers and goods are carried. But the form of trading can make no difference. If it were a mine or a jute-mill equally with a railway, the person who governs the whole commercial adventure, the person who decides what shall be done in respect of the adventure, what capital shall be invested in the adventure, on what terms the adventure shall be carried on—in short, the person who, in the strictest sense, makes the profits by his skill or industry, however distant may be the field of his adventure—is the person who is trading. That person appears to me, in this case, to be the appellant Company. Every one of the tests I have applied are applicable to its proceedings. A shipowner, or indeed a shipbroker,

may not have any one of the ships or the charter-parties which he negotiates in England; but, by correspondence or by agency, he may have both charter-parties and ships, not necessarily British ships, all over the globe. But if he lives in London, and by his direction governs the whole of this commercial adventure, could it properly be said that he is not carrying on his trade in London? So it appears to me that the appellant Company is carrying on trade in London, from which it issues its orders, and so governs and directs the whole commercial adventure that is under its superintendence. I am, therefore, of opinion that the appeal must be dismissed with costs; and I move your Lordships accordingly.

Lord WATSON: The decision of this appeal does not involve any new controversy upon the construction of the Income-Tax Acts. It depends, in my opinion, upon the answer which ought to be given to a single issue of fact. The law which must govern the present case appears to me to be settled by the judgment of this House in *Colquhoun v. Brooks* (14 Appeal Cases, 493). It was held in that case that the interest of a partner, resident in England, in the profits of a trade which was exclusively carried on in Australia by the other members of the firm, was chargeable with income-tax, not under the first, but under the fifth, case of Schedule D. The noble and learned Lords who took part in the decision were of opinion that the interest of the English partner was included in the sweeping language of the first case; but they held that it also constituted, within the meaning of the fifth case, a possession in one of Her Majesty's dominions out of the United Kingdom. The ground upon which the interest was held to be taxable in terms of the fifth case was that the Income-Tax Acts contain no machinery for assessing, under the first case, profits accruing from any trade which is not wholly or in part carried on within the United Kingdom, whereas they do provide machinery for assessing, under the fifth case, all profits arising from trade exclusively carried on outside of the United Kingdom. In my opinion, the decision in *Colquhoun v. Brooks* directly affirms the rule that every interest in the profits of trade belonging to a person who is, within the meaning of the Acts, resident in the United Kingdom, must be charged under the first case of Schedule D, if the trade is carried on, either wholly or partly, within Great Britain or Ireland, and is chargeable under the fifth case if the trade is exclusively carried on in any of Her Majesty's dominions out of the United Kingdom. The considerations which are applicable to trades wholly carried on in these dominions apply with equal force to trades exclusively carried on in foreign possessions which are not subject to the British Crown; and it appears to me to be matter of necessary implication that the interest of a resident here, in profits derived from a trade of the latter description, must also be assessed for income-tax under the fifth case of Schedule D. When it has been ascertained that a person interested in the profits of a trade has his residence in the United Kingdom, in such sense as to bring him within the incidence of the Income-Tax Acts, the only question remaining for determination is whether the measure of his liability is to be found in the first or in the fifth case of Schedule D. In the one case, he is liable to pay duty in respect of the net profits accruing to him from such trade; in the other, in respect only of such part of these profits as shall have been actually received by him in this country. But he cannot, according to the rule established in *Colquhoun v. Brooks*, escape from liability under the first case unless he is able to show that no part of the trade is carried on within the United Kingdom, or what comes to precisely the same thing, that it is exclusively carried on in a country or countries outside the United Kingdom, whether subject to Her Majesty or not. If he succeeds in proving that fact, his liability will be under the fifth case. The appellant is an English Company incorporated with limited liability under British statutes, and having its registered office in London. It is not disputed that the Company has its domicile in England, and is liable to pay income-tax in respect of any profits earned in the course of its trade. The only complaint made is that the amount of such profits has been assessed for duty under the first case; whereas the appellants maintain that it ought to have been assessed under the fifth case, because the trade of the Company is wholly carried on beyond the limits of the United Kingdom. I have no difficulty in rejecting that contention. It is not necessary to consider whether the whole trade of the Company ought to be regarded as carried on in England. To my mind, it is perfectly clear that, in point of fact, part of its trade is carried on there, and that is sufficient to bring its profits within the first case of Schedule D. It is no doubt true that the undertaking, in order to carry on which the Company was incorporated, consists, as its Memorandum bears, in "the making, maintaining, managing, and working" of a railway in Brazil, and in "the making, maintaining, managing, and working" of branch lines, roads, canals, and other means of communication in connection with the main line. It is also true that the Directors, as authorized by the Articles of Association, manage and work the railway and its connections through a Superintendent in Brazil, appointed by them, and a staff of servants in Brazil who are under his immediate supervision; and that the receipts of the Company, from which profits made by it are derived, are earned and paid in Brazil. But the substantial fact remains that the Directors, subject to any resolutions which may be passed for their guidance by the members of the Company, are vested with the sole right to manage and control every department of its affairs. Apart from the authority, express or implied, which they have from the Directors, neither the Superintendent nor any other servant of the Company has any power to act in the carrying on of its trade. They are in no sense traders—they are merely servants; and in that capacity they are remunerated for the services they are employed to perform. The profits of the undertaking, though they are received by these servants, do not belong to them, and are not in their disposal. Their only duty, unless otherwise directed by the Company, is to transmit them to London; and the Company here is the sole judge whether they ought or ought not to be distributed among its members. The only persons who can with propriety be described as carrying on the trade of the Company are its Directors, who, for all purposes of administration and management, are the Company itself. I do not think that in such circumstances the particular localities in which debts are incurred to the Company, or are paid to its agents, are of any consequence in ascertaining by whom its trade is carried on. I therefore concur in the judgment which has been moved.

Lord DAVEY: I may content myself in this case with saying that the business of the appellant Company is not, on the facts stated in the case, entirely or exclusively carried on abroad; and therefore that the case of *Colquhoun v. Brooks*, on which the appellants' Counsel relied, is no sufficient authority for the proposition which they maintained. No doubt the profits of the Company are derived from the profitable use of land in Brazil, and from the business of carriers carried on in that country, and in that sense it is a Brazilian business. But it is not sufficient to say that the Company are carrying on a Brazilian business, as Mr. Justice Wright thought, if the Company is carrying on that business wholly or partially in this country. It is clear to my mind that the direction and supreme control of the appellant Company's business is vested in the Board of Directors in London, who appoint the agents and officials abroad, and, either by general orders or by particular directions, control or may control their duties, remuneration, and conduct, and to whom any question of policy or any contract or other matter may, and if deemed of sufficient importance I suppose would, be referred for their decision. The business is, therefore, in very truth, carried on in and from the United Kingdom, although the actual operations of the Company are in Brazil, and in that sense the business is also carried on in that country. I do not attach any importance to the fact of the railway and business belonging to a corporation and not to an individual, except that, in the case of an English joint-stock company, formed for the purpose of carrying on a particular business, it is, perhaps, easier to say where is the seat of administration and direction. In my opinion, therefore, the case is outside both the decision and the reasoning of the noble learned Lords who gave judgment in the case of *Colquhoun v. Brooks*, because I find that every one of those noble and learned Lords confined his observations to a case in which the business was entirely carried on abroad. Whether it would be possible in any case for a sole owner of a foreign business having exclusive power of control over it, but resident in this country, successfully to maintain that he did not carry on a business here, it is unnecessary to say. That question, which is probably one of fact, will be dealt with when it arises according to the circumstances of the case. I am, therefore, of opinion that the business of the San Paulo Railway Company is not a "foreign possession" within the meaning of the fifth case of sec. 100, Schedule D, as interpreted in *Colquhoun v. Brooks*. That being so, the case undoubtedly falls within the language of the first case; and it follows that the Company have been rightly charged upon the whole of their profits or gains.

The appeal was accordingly dismissed, with costs.

## The Rateability of Coal Mines for Water.

The Judicial Committee of the Privy Council, consisting of Lords Hobhouse, Macnaghten, and Morris, and Sir R. Couch, recently had before them an appeal from a judgment of the Supreme Court of New South Wales (one learned Judge dissenting), given on Sept. 17, 1894, by which a verdict in favour of the Hunter District Water Supply and Sewerage Board was set aside, and judgment entered for the Newcastle Wallsend Coal Company, Limited, in an action brought by the Board against the Company to recover money due for water-rates. The action was commenced by the Board, who are constituted under an Act of Parliament of 1893, against the Company, who are the proprietors of a large coal-mining area of 8772 acres, situated in various boroughs, with a connecting railway. The Board contended that the property was in their water district, and was rateable for water under the provisions of the statute. The Company, on the other hand, pleaded that their land and tenements were not liable to be rated; and that the Board did not, by bye-laws, duly make and establish the water-rates in conformity with the Act. The question whether or not the property of the Company was rateable depended on the construction of the statute and bye-laws, and was said to be of considerable importance to the colony. At the trial, a verdict was entered by consent for the Board for the amount claimed—£796, with leave to the Company to move to enter the verdict for them or to reduce the amount. The rule *nisi* was argued before the Supreme Court, who ordered the verdict for the Board to be set aside and judgment entered for the respondents, with costs. Mr. Justice Foster differed from his learned colleagues in that order. The case was argued before the Judicial Committee by Mr. Cozens-Hardy, Q.C., Mr. Vaughan Hawkins, and Mr. W. H. Cozens-Hardy for the appellants; Mr. Joseph Walton, Q.C., Mr. Wood Hill, and Mr. H. G. Davies representing the respondents. At the close of the arguments, their Lordships reserved judgment. This was given on the 7th inst. by Lord Macnaghten, who said their Lordships would advise Her Majesty that the appeal ought to be dismissed, with costs against the appellants.

## Financing a Contractor.

In the Queen's Bench Division of the High Court of Justice last Wednesday, Mr. Justice Hawkins and a common jury had before them an action brought by Mrs. Isabella Dixwell upon a covenant made by one Dierden to repay £385 advanced to him by her, with interest thereon. Mr. Carrington stated that in 1892 plaintiff agreed to lend to the defendant, a contractor, who was negotiating for a concession to light Liége, in Belgium, two sums of £250 each. She was to be paid 10 per cent. interest, and she was to have a share amounting to £2000 in the concession, should it be obtained. She advanced the first £250 and £135 on account of the second £250; but she did not advance the remaining £115. In the course of discussion, it was admitted that the case for the plaintiff was made out; but the defendant's counter-claim was insisted on, and he was examined in support of it. It was said that, had the remaining £115 been advanced, he should probably have obtained the concession he sought, and have realized from the work a profit of £3000. It was upon this state of things that he counter-claimed. The evidence having concluded, his Lordship asked Mr. Macorm, who appeared for the defendant, if that was his case. Mr. Macorm said it was. Mr. Justice Hawkins: Then you have no case. Mr. Macorm submitted that that was rather a question for the jury. The jury found for the plaintiff upon the claim for £385—interest not being insisted on; and there was also a verdict for the plaintiff upon the counter-claim.

### Stealing from a Prepayment Meter.

At the Lambeth Police Court on Monday last week, Harold Scarse, 16, a labourer, and Reuben Porter, 14, a schoolboy, were charged on remand with being concerned together in breaking open an automatic prepayment gas-meter, and stealing therefrom money belonging to the South Metropolitan Gas Company. It appeared from the evidence that Scarse's parents occupy a house at Camberwell, which is supplied with gas by means of a prepayment gas-meter. On three occasions, the money-box attached to the meter had been broken open, and the contents abstracted. Scarse admitted the thefts, and made a statement implicating Porter. Beyond Scarse's allegations, there was no evidence against Porter. Police-constable Carter stated that Scarse had held several situations, but had been discharged from each. Mr. Hopkins sentenced Scarse to 21 days' hard labour; but he ordered Porter to be discharged.

**Reductions in the Price of Gas.**—The Burslem Town Council have adopted a recommendation of their Gas Committee that the price of gas be reduced, from Jan. 1 next, to 2s. 9d. per 1000 cubic feet, with an allowance of 3d. per 1000 feet if payment is made within one month after demand, and that an equivalent allowance of 1d. in the shilling be made in favour of consumers using prepayment meters. The Directors of the Durham Gas Company have given notice that the price of gas will be reduced from 3s. 5d. to 3s. 2d. per 1000 cubic feet from the 1st prox.

**The Gas Question at Settle.**—It is reported in regard to this matter that the shareholders of the Settle Gas Company have agreed to the terms upon which they are disposed to part with their property to the District Council. The Local Government Board, however, have refused to grant the Council the power to purchase; and the negotiations will therefore fall through, unless the Board see fit to reconsider their decision. The streets are at present lighted by oil-lamps; the Council considering the Company's charges too high, although a reduction on former prices was offered.

**Dispute between the Queenstown Town Commissioners and the Gas Company.**—The Queenstown correspondent of the *Freeman's Journal*, writing on the 16th inst., says: "As the result of a dispute existing between the Queenstown Town Commissioners and the Queenstown Gas Company, the latter body have refused to light the public lamps; the consequence being that on Saturday night and again last night the entire town was in a state of darkness." This condition of things continued until last Wednesday, when, through the intervention of the Bishop of Cloyne, the matter in dispute was satisfactorily settled, and the town was again lighted.

**Adoption of Automatic Retorts at the Leeds Gas-Works.**—Our readers are aware that the Gas Committee of the Leeds Corporation have been visiting various gas-works with the object of obtaining information in regard to the working of automatic gas-retorts, in view of their adoption in connection with the extensions at the Meadow Lane station. The section of the Committee having charge of this establishment recommended the full Committee to adopt the automatic system; and at a meeting of that body held last Thursday, this was agreed to. If it should subsequently be determined to give the fullest possible scope to the system, the equipment of the new premises in Meadow Lane will include 192 retorts operated on this plan, which the Committee estimate will result in a saving of 50 per cent. in the wages paid.

**Explosion at the Worthing Gas-Works.**—A leakage of gas, resulting from a defective valve, caused an explosion in the governor-house at the Worthing Gas-Works shortly before eight o'clock on Monday night last week, and the ignited gas set fire to the roof of the building, and burnt it off. In order to avoid feeding the flame, the gas was turned off at the main; and the town was consequently suddenly deprived of its light. Owing to the promptitude and energy displayed by the Fire Brigade, under the superintendence of Captain Crouch, the fire was soon extinguished, and all cause for alarm removed. As a matter of fact, the supply of gas could have been restored by ten o'clock; but the Company's Manager (Mr. W. A. Walker) thought it prudent not to turn any gas into the mains until the consumers had been notified on the following morning, so as to avoid the risk of explosion from taps inadvertently left turned on. The Company's Secretary (Mr. W. F. Verrall) sent a letter to the Town Clerk, expressing the regret of the Directors that the town should have suffered inconvenience through the fire, the cause of which they had made the subject of very careful inquiry, with the result that it had been traced to the valve, the defect in which was a slight one, which could not have been foreseen. On the following day, the necessary repairs were effected; and no further interruption of the supply took place.

**Bilston Gas Company.**—The annual report of the Directors of this Company states that the profit and loss account, after paying the usual interim dividend, shows a balance of £3768. From this amount the Directors propose to pay dividends of 5s. and 3s. 6d. per share on the "A" and "B" shares; making, with the interim dividends, 10s. and 7s. respectively, for the year, and leaving a balance of £1353 to be carried forward. The total receipts amounted to £20,026; the expenditure, to £15,167—a difference of £4859. The Directors express regret that, through the depression in trade in the earlier portion of the year, the amount realized by the sales of residuals has been £650 less than in the previous year, and that there has also been a slight falling off in the sales of gas. These disadvantages have been greatly aggravated by the large increase in the rates and taxes, consequent upon the altered assessments of the works and mains. The amount paid on this account has been almost doubled since the year 1893, and now equals nearly 4d. per 1000 cubic feet of gas sold. So that for each 20s. paid in dividends to the shareholders, over 6s. has to be contributed in rates and taxes. In the opinion of the Directors, this amount is unreasonably excessive; and were ordinary commercial undertakings taxed in the same proportion, the burden would be deemed intolerable. The Directors will endeavour at the first opportunity to get this heavy assessment reduced.

## MISCELLANEOUS NEWS.

### CHRISTMAS TIME AT THE YORK GAS-WORKS.

Last Saturday, Mr. Charles Sellers, the Engineer and Secretary of the York United Gas Company, delivered his usual Christmas address to the workmen. In the course of it he said:—

Once more "A Merry Christmas and a Happy New Year" to you all. A threadbare wish it may be; but it is ever fresh to youth, to manhood, and to old age. For convenience, I will divide the wish into two parts. First, I will deal with the time-honoured wish for "A Merry Christmas"—a wish which has resounded through the corridors of a long, long past, and which to-day brings up the memories of merry England in her merriest moods, brings up the memories of the "Fine Old English Gentleman," who—

> "When winter cold brought Christmas old, he opened house to all,
> For while he feasted all the great, he ne'er forgot the small."

And this is the text which should inspire all men who wish to make for themselves a merry Christmas; for on the lines of the fine old English gentleman, no man can be merry who sees others sad, as no man can really enjoy a feast who knows that a Lazarus is picking up the crumbs which fall from his table. Christmas, too, is peculiarly a time for opening the heart as well as the purse. It is not a time to remember those who have "trespassed against us," but rather a time to prompt us—

> "To tak' a cup o' kindness yet
> For auld lang syne."

Not, however, with the tardiness of the man who, when on his death-bed he was urged to forgive a neighbour, replied: "If I don't get well I'll forgive him; but if I do, then he must look out." There are many ways of making a merry Christmas. Then there is the foolish habit of making it at a cost beyond one's means, and afterwards paying for the feast by pinching and running into debt. A happy Christmas is not measured by the money spent upon it. A wise authority has said: "Better is a dinner of herbs where love is, than a stalled ox and hatred therewith." Therefore, let your Christmas be simple, and not costly; and let me urge you to spend your happiest hours at your own firesides.

Coming to the wish for "A Happy New Year," let us start fair and be sensible. Let us acknowledge that it is no more use wishing for a Happy New Year upon unhappy conditions, than it is to wish for figs to grow upon thistles. In our Christmas reunions, we have reviewed many conditions of home and social life; but there is one which we have not reviewed. I mean the influence upon home life of the cardinal virtue contained in the old command, "Honour thy father and thy mother," for on loyalty to this command happy homes and happy new years so much depend. "Spare the rod and spoil the child," was formerly a code in family discipline; but now the tables are turning, and old codes are going out of fashion. The modern youth too often tramples upon the lessons of the past, and instead of helping, by his conduct, to bring to his parents—

> "That which should accompany old age;
> As honour, love, obedience, troops of friends"—

he too frequently speaks of his father as "the old boy," the "old buffer," and the "old governor;" while in polite society the terms "*mater*" and "*pater*" are being substituted for the home-sounding and love-inspiring "father" and "mother." But all such terms are either akin to slang or affectation, and tend to weaken the command, "Honour thy father and thy mother," and tend also to weaken the conditions for a Happy New Year. Unlike mercy, which "blesseth him that gives and him that takes," dishonour to parents curses both parents and child alike.

Lastly, be thrifty, and always save something, even pence, for pounds will take care of themselves, and you will find pounds a capital help to a Happy New Year. Be sober; for a Happy New Year never did go hand in hand with insobriety. Be loyal to your employment; for nothing pays better as an investment than faithful discharge of duty. And to those of you who have not had a honeymoon, I would say, "Do not rely too implicitly on honeymoons; for, like happy new years, honeymoons largely depend upon obedience to the command, 'Honour thy father and thy mother.'"

Upon our own business, we need say little. In the lighting world, we still hold the field; and in other fields, we are extending our borders. There was a time when every long-haired orator, in his wild imaginings, upon the electric light, strewed the field with our bones; while every day theorists did not hesitate to predict to a fortnight how long gas men had to live. But now, with Bray's improved burners, and the incandescent principle for gas lighting firmly established and fast becoming wholesale, gas men can defy all comers; and instead of losing a wink of sleep in fear of competitors, they may, with the greatest confidence, eat, drink, and be merry. And if on the "light of the future" men say, as I have no doubt they will, that my opinions are prejudiced, let them look at the opinions of capitalists—men who have no prejudices, and who never need to be told on which side bread is buttered; and they will find that, while capitalists now give a higher value for gas property than they have ever given before, they are beginning to think twice and thrice before putting their *own* money into the electric light.

Mr. Sellers then said he had pleasure in distributing the usual Christmas gifts (towards which the Directors of the Company had contributed) of books, toys, and articles of dress to all the men who had children. He also distributed twelve Christmas cakes to a similar number of men with the largest families—a custom practised by his mother in her lifetime.

A hearty vote of thanks was accorded to the Directors; and cheers were given to Mr. Sellers for his address.

## HUDDERSFIELD CORPORATION GAS SUPPLY.

### Ratepayers' Opposition to the Proposed New Powers.

In moving the adoption of the minutes of the Gas Committee at last Wednesday's meeting of the Huddersfield Town Council, Alderman Stocks dealt at some length with the opposition which the proposals of the Committee encountered at the recent statutory meeting of ratepayers (p. 1205). He said that, as Chairman of the Gas Committee, his mouth was sealed as to the immediate future, as the Committee would have to consider what they would do. Whether the ratepayers were wise or not in their opposition to the loan of £100,000 which the Committee had asked for, it was not for him to say. He did not say that the Property Owners' Association was not a good institution. Properly conducted, it might be very helpful to the Corporation; but as it was to be in antagonism, the public interests would suffer. He was not aware of any of the alleged extravagance at the gas-works; but the work done had been carried out efficiently and well, and with the full sanction of the whole Council. The Committee had not on their own authority spent a single shilling. He went on to show that the reconstruction of the works had been absolutely necessary. During four days in 1894, they were within a few hours of having the whole town in darkness. At the commencement of that period, during which a dense fog prevailed, they had in store 3,500,000 cubic feet of gas; the works were running at the fullest pressure, and yet, when the need for the abnormal supply ceased, they had only about a quarter of a million feet of gas in store. Had the fog continued longer, the town would have been without its service of gas. Steps had been taken to avoid such a serious contingency in the future; and a second contract, covering important reconstructions, was on the point of completion. It had been said that the Corporation obtained the works at a fair price. That was true, if giving 30s. for a sovereign could be so described. The works stood them at a capital cost of about £6 per ton of coal carbonized; whereas engineers told them that the cost per ton should not exceed £4 5s. He believed that at Leeds, Bradford, and Halifax that was something like the cost of the works. As a consequence, it was impossible to produce the gas as cheaply as it was made in those towns. There would at the end of the financial year be a suspended debt of about £60,000; and unless it was met gradually by profits from the sale of gas, it would have to be met by a rate in aid. Several members of the Council adhered to their allegations as to the defects in public and private lighting; and the minutes of the Gas Committee were then approved.

## ELECTRIC LIGHTING NOTES.

About two years ago, the old Board of Works for the Hackney District obtained an Electric Lighting Provisional Order; but, until recently, no steps were taken in the direction of acting upon the powers thus conferred. Some months ago, however, a Committee was appointed to inquire into the whole matter; and having first secured the services of Mr. F. Hastings Medhurst, M.Inst.E.E., they have visited several towns where the electric light is under municipal control, and where, in certain cases, a combined system of dust destruction and electric lighting is in operation. The Vestry recently had before them the reports of the Committee and Mr. Medhurst. As a result of their visits, the Committee expressed themselves strongly in favour of the practicability of the combined scheme of electric lighting and refuse destruction proposed by Mr. Medhurst. The Committee also assured the Vestry of the safety of Mr. Medhurst's estimate, both as regards the cost of burning the refuse, and as to the capital and general expenditure on the electrical works, and the revenue to be obtained therefrom. The Committee recommended the Vestry to adopt Mr. Medhurst's scheme, and asked permission to engage him to prepare the necessary plans and specifications. Mr. Medhurst recommends the provision of an initial installation capable of supplying 16,000 8-candle private lights and the 140 arc lamps of 1000-candle power each, which will be required to efficiently illuminate the main thoroughfares the Vestry will have to immediately take in hand. He thinks it is extremely improbable that of the 16,000 lights more than 11,500 will ever be simultaneously alight; so that the estimates of cost and plant are on this basis. He recommends the adoption of the high-tension alternating current system of distribution. The streets included in the compulsory area have a total length of about four miles; and lamps of 1000-candle power at 100 yards apart, on each side of the street, would number 140 to efficiently light this area. The annual cost of electrically lighting these streets will be £1800—three times the cost of the existing 188 gas-lamps. But the light from dusk to midnight will be sixteen times greater, and from midnight till dawn eight times greater, than it is at present. At the exceptionally low charge of 5d. per unit (which Mr. Medhurst says is about equal to a charge of 2s. 6d. per 1000 cubic feet of gas), the supply for private lighting would, he estimates, yield at least £6666. To this must be added the saving on the disposal of refuse £3500; and the present cost of street lighting (£519) must also be set against the total expenditure. Thus the estimated total profit amounts to £10,685; and the total working expenses of the entire system could not, he says, exceed £5357—leaving the prospect of a revenue from this investment of no less than £5328. The interest and sinking fund would absorb about £4000 of the income; leaving a clear net profit of about £1328 a year, which Mr. Medhurst thinks would increase to £2000 or more, especially if there were a fair demand for electrical energy during the daytime. The capital outlay is, of course, the principal item; and this Mr. Medhurst confidently limits to £80,000.

The dangers attending electric lighting were once more exemplified on Monday last week, when John Pugh, aged 27, a cable joiner in the service of the Electric Lighting Department of the Cheltenham Corporation, met with his death under circumstances which were investigated by Mr. J. Waghorne and a jury on Wednesday. It was shown that the deceased was at work in a sub-station, putting up a low-tension switchboard near a high-pressure board on his left, and was boring a hole in a batten against the wall. In the act of "changing hands" in his work, he brought his left arm against one of the terminals on the high-pressure board; receiving a shock which caused him to fall forward against the switch. The foreman, who was standing on his right, also received a shock, which he described as being like an enormous blow. All efforts to restore animation failed, though a doctor was on the spot immediately. The evidence showed that the deceased had been cautioned against danger, even up to within a few minutes of death; and india-rubber gloves and a mat were provided for work on high tension. But in the case of the work deceased was employed upon, they were not necessary; and he had declined to use the mat, though had he done so he would probably not have lost his life. Mr. M. H. Kilgour, the Electrician to the Corporation, said the current was conveyed to the station at 2000 volts pressure, and there transformed to 100 volts for general supply. He believed the sub-station was one of the safest in England, and larger than those generally in use. After a most exhaustive inquiry, the jury returned a verdict of "Accidental death;" no blame being attached to anyone.

Shrewsbury has now a supply of electrical energy from works which are the property of the Shropshire Electric Light and Power Company. The station contains three engines and dynamos, each of which is large enough to keep 1000 8-candle power lamps alight at one time. The total capacity of the generating plant at present installed, allowing one engine and dynamo as a reserve, is sufficient for lighting about 4000 8-candle power lamps fixed on consumers' premises; and Mr. A. H. Preece, the Consulting Engineer, is convinced that, as soon as the Company are able to obtain this number of lamps, a good profit will be made on the capital expenditure. The present charge is 8d. per unit; but a reduction to 7d. is to be made with the New Year. The station was formally opened on the 10th inst.; and in conjunction with the inaugural ceremony there was an exhibition of electric lighting and cooking appliances. Of course, a good deal was made of the event in the local paper. The "function" was described as "one of the most interesting and important ever witnessed in the county town;" and it was "a conspicuous success." No doubt seems to be entertained that the Company have "a brilliant future"—possibly distant—before them. They started work on Aug. 1 last; and they have only about a score of customers, none of whom are very large.

A Local Government Board inquiry was held at Harrogate last Tuesday, by Mr. W. F. B. Clarke, regarding an application to the department by the Town Council for sanction to borrow £27,000 under their Electric Lighting Act of 1892. Of this sum, £6500 is required for buildings, and £20,500 for plant, &c. It was stated by the Town Clerk (Mr. W. H. Wyles) that the Corporation had reason to think they had the most modern and perfect system of electric lighting for the borough.

The recommendation of the Electric Lighting Committee of the Eccles Corporation, that a scheme of electric lighting should now be carried out (*ante*, p. 1249), was under consideration at a meeting of the Council yesterday week. It was determined that, in order to afford time to place the fullest information possible before the ratepayers, the consideration of the question should be deferred until April 1 next, and be then discussed at a special meeting of the Council.

We learn that a Sub-Committee of the Bradford Gas and Electricity Committee have been supplied with copies of the report of an expert on the condition of the Corporation electricity works. It is generally recognized that the works are too small to serve the purposes of so large a town as Bradford, and are not capable of sufficient extension on the present site; while, on the other hand, the pressure of applications for the supply of the light is so great that some extension is unavoidable. It is probable that the Committee will immediately lay a proposal before the Council.

## RECENT SALES OF SHARES.

On Monday last week, Mr. Alfred Richards sold several parcels of stock and shares in gas undertakings. "A" stock of the *Tottenham and Edmonton Gas Company*, entitled to 10 per cent., but actually carrying 11½ per cent., fetched £273 per £100 of stock. New ordinary 6 per cent. stock of the *Wolverhampton Gas Company*, entitled to 6¾ per cent. in June next, sold for £158 to £160 per cent. Consolidated stock of the *Reigate Gas Company*, the last dividend on which was at the rate of 10 per cent. per annum, with 2 per cent. bonus in addition, fetched £267 10s. per £100. Some fully-paid £5 "B" (7 per cent.) shares in the *Romford Gas Company* were sold for £8 each. On the same occasion, Mr. Richards offered 150 £10 shares (£8 paid) in the *Gas-Meter Company, Limited*, for public competition. This was unquestionably the feature of the sale. These shares are very seldom in the market; for, seeing that the last dividend was at the rate of 10 per cent. per annum, with a bonus of 7½ per cent., holders naturally cling to them. However, here was a parcel of 150; and Mr. Richards knocked them down at no less than £25 each—a surprisingly high figure.——A few days ago, 399 £10 shares in the *Bromley Gas Company*, bearing 7 per cent. interest, were sold by auction at prices varying from £19 to £19 5s. each; and 90 similar shares (with the half-year's dividend) realized an average of £20.——A sale of 3⅛ per cent. debenture stock in the *Newcastle and Gateshead Gas Company* last Wednesday produced an average of £116 16s. 5d.——On the same day, Messrs. Hollis and Webb sold at Leeds £2500 of additional £10 shares in the *Rothwell Gas Company, Limited*; the prices obtained ranging from £14 5s. 6d. to £14 11s.——At Preston last Wednesday, £100 of "A" stock of the *Preston Gas Company* realized £200; and £283 of "B" stock in the same concern sold for £167 per £100.——At the Mart, last Thursday, Messrs. J. and W. Tharp sold £675 of new stock of the *Commercial Gas Company* for £1701; and 97 £5 shares in the *West Ham Gas Company*, for £1165.

**Abandonment of the East Warwickshire Water Bill.**—The Chairman of the East Warwickshire Water Company (Captain H. Townshend) has informed the Nuneaton District Council that the Company's Bill, of which notice has been given, will not be proceeded with until next session, on account of there not being sufficient time to fully consider all the clauses.

## CHELSEA WATER-WORKS COMPANY.

The Half-Yearly General Meeting of this Company was held at the Offices, Commercial Road, Pimlico, last Thursday—Sir W. H. WYATT (the Governor) in the chair.

The SECRETARY (Mr. G. H. Gill) read the notice convening the meeting, and subsequently the minutes of the last general meeting and the reports of the Government Auditor (Mr. A. Stoneham) and of the Company's Auditors. The latter (Messrs. J. A. Hallett and H. P. Bodkin) stated that they had again great pleasure in expressing their entire satisfaction with the clear and precise way in which the accounts had been kept. The report of the Directors was taken as read.

The GOVERNOR, in moving its adoption, said he thought the proprietors must all have been well satisfied with it, and with the statement of accounts. Instead of being obliged, like some of the other Water Companies, to be satisfied with a lower dividend, they were able to maintain theirs, and to make a small additional payment in respect of former dividends which had fallen short of the maximum statutory rate of 10 per cent. He could assure them that this had not been done without placing everything to revenue account that it had been possible to debit thereto. They had charged to revenue every shilling of the cost of lowering the mains; but, at the request of the Government Auditor, who particularly wished it, as he had to deal with other Companies who did not like this plan of proceeding, they had charged £200 of the cost to capital account. They had, however, done this with some regret, though it was open to consideration whether a proportion of the outlay might not be debited to capital account. The amount charged to that account, however, ought certainly not to be very large, because the chief expense was in opening and closing the ground; the extra foot or so by which the mains were lowered not being a very costly proceeding. They, however, thought it well to comply with Mr. Stoneham's request. Some of the other Companies had not wished to charge anything to revenue, but would have liked to put all the expense to capital; and they had at present placed the amount to a suspense account. The Chelsea Company's Directors, however, had, as he had said, charged everything they possibly could to revenue, for the contingency fund meant revenue, being nothing but accumulated profits made in former years. They believed they had now finished all the pipes in their district, though he did not say they had paid for everything, because they had not been able to get in all the accounts between June 30 and Sept. 30. He thought the proprietors would regard it as satisfactory that the Directors had been able to recommend a small increase in the dividend, in the shape of a payment on account of back dividends. They could have paid quite easily another 2s. 6d. per cent., and still have had a good balance over on the half-year's trading; but they had considered it to be more in the interests of the proprietors, and of the concern as a whole—the September half being always better than the March half of the year—to carry forward £1400 odd to the next half. He thought there was a very reasonable hope—though, of course, he could not say more than this—that they might be able to continue the payment of the 2s. 6d. per cent. If they were able to do this, it would be advantageous in all ways. It would keep their stock steady. Its nominal price was now very high; and they certainly did not seek to do anything to encourage its further rise, because this might lead to disappointment hereafter. The great thing they had to contend with, and it was a cruel shame, was the amount of law expenses which the London County Council put them to. Last year they expended on parliamentary matters £2400, all of which was charged to the contingency fund, which, however, as he had said, was practically revenue. The County Council did not mind what they did in introducing Bills. But the Companies had to defend themselves; and parliamentary and law expenses represented a most expensive luxury. He hoped, however, that an end might sooner or later come to this state of things. Probably the proprietors had seen what occurred on the previous Tuesday at the meeting of the County Council. He did not think there was much in it, one way or the other; and he could not say whether or not it would at all stop these outlays. If it had not been for the parliamentary expenses which the Company had been compelled to incur—amounting, as he had said, to £2400 (and most of the other Companies had had to pay more)—they might have paid a nice little extra dividend. The Directors had impressed this very strongly on their Solicitor—that beyond actual defence they did not wish to go; they did not desire to encourage any unnecessary outlay. But he did not know how expense was to be prevented if they were to defend their interests when they were attacked. The County Council did not mind what they spent. For instance, in the recent inquiry before Colonel Ducat, they had a grant of £250 from the Council. But they afterwards asked for another £650; and probably a further supplementary estimate would come forward before long. Another matter which rather concerned them was the new assessment of the Company's property. They had resisted it as far as possible, and had been able to settle in every case except Kensington, where such an enormous increase was wanted from them that they intended to resist the demand; and he hoped they would succeed. The assessments already fixed would, however, make a considerable difference to the Company and to all the other Water Companies; in their case, they reckoned the additional charge at £2000 a year. But against this they were able to make a favourable contract for coal, which would help them to pay some of the increase in the assessment. He therefore hoped that, on the whole, they might continue to do well.

The DEPUTY-GOVERNOR (Mr. F. S. Clayton) seconded the motion.

Mr. E. T. E. BESLEY thought that the report was the most satisfactory one that had been produced by any of the Water Companies; and he ventured to say that it really understated the prosperity of the Company, inasmuch as their investments were very much below their present market price. It was quite correct to put them at their cost price; but it should not be lost sight of that the difference between cost and present market value represented another good asset. In connection with the expense caused by the phenomenal frost, the Chelsea Company had suffered insignificantly in having to pay about £1800. He saw no precise statement as to the actual cost caused by the frost; but he presumed it was very much less than the £28,800 which it would cost the Lambeth Company.

The GOVERNOR stated that the £1800 was the expenditure incurred simply in lowering the mains. The outlay in connection with the frost, for repairing broken pipes, and so on, would perhaps be from £1500 to £2000.

Mr. BESLEY said that in that case he had certainly not wrongly described as insignificant the cost to which the Company had been puts in comparison with the Lambeth Company. The principle upon which the Government Auditor had acted in allocating to capital account a portion of the expense of lowering the mains was, as he understood it, that this proceeding would be for the benefit of the public in future years. Mr. Stoneham, however, had only allowed a very small proportion of this expense to be debited to capital. So far from the present price of the Company's stock being too high, he did not think the market figure represented its real value; and his own opinion was that it must continue to advance. Altogether, the report reflected the utmost credit on the Directors, and upon all who were connected with the management of the Company.

The motion was then carried unanimously; and resolutions were afterwards passed declaring the dividend on the preference stocks, and the distribution recommended on the ordinary capital.

Mr. BESLEY proposed a cordial vote of thanks to the Governor and Directors for their management of the Company's affairs, as well as to the officers for their assistance. He said he might perhaps be allowed to take this opportunity of expressing a hope that the Company would not withdraw their Bill, even though the London County Council might object to the proposed outlay, which was entirely for the benefit of the consumers, and would not bring a penny of profit to the shareholders. He thought it was very desirable that the public should know, if the County Council opposed such a Bill, how that body were influenced by prejudice against the Water Companies.

Mr. H. P. BODKIN seconded the motion, and it was carried.

The GOVERNOR, in acknowledging the vote, said he had been extremely glad that Mr. Besley had thought fit to make the remarks he had addressed to the meeting. He never liked to say anything which might appear to be in praise of themselves, but which might imply unfair comparison with other Companies. He could assure the proprietors that the Directors had worked hard, and that they were still working hard to keep down expenses fairly, and to promote the prosperity of the Company.

The proceedings then terminated.

## THE LONDON COUNTY COUNCIL AND THE WATER QUESTION.

### Rejection of the Proposal for a Water Authority—The Cost of the Flushing-Cistern Inquiry.

At the Meeting of the London County Council last Tuesday—Sir A. ARNOLD in the chair—the report of the Parliamentary Committee with regard to the lines on which the Government were to be asked to legislate on the question of the water supply of the Metropolis came up for consideration. The report was published in the JOURNAL last week; the Committee's recommendations being as follows:—

(1) That Her Majesty's Government be invited: (*a*) To constitute by Act of Parliament a Public Authority for the water area defined above. (*b*) To vest in such authority, when constituted, the powers now exercised by the Metropolitan Authorities under the Metropolis Water Acts in reference to the Water Companies, and certain of the powers now possessed by the Local Government Board, with a view to improved administration and efficient control. (*c*) To confer upon such authority power to negotiate for the purchase of the respective undertakings of the Water Companies, and to give effect to such purchase in such manner as may be found expedient, and, if thought fit, to seek parliamentary powers for the acquisition of the undertakings otherwise than by agreement, and for dealing with the whole question, including that of future supply.

(2) That, pending the constitution of such authority, the Council do authorize negotiations to be initiated by the Parliamentary Committee with the Water Companies for the purchase of their undertakings.

(3) That, with a view to the Council coming to a decision on the pressing question of new sources of supply as compared with a scheme of storage reservoirs, the Water Committee be instructed to report their final conclusions without delay.

Mr. H. P. HARRIS, the Chairman of the Committee, explained that the report was the outcome of the Council's resolution of the 22nd of October. That resolution was passed against the wishes of those who were responsible for the present report. The Committee at the time proposed that the Government be asked to deal with the London Water Question, with a view to an agreement being arrived at between all parties concerned. The majority of the Council, however, declined to accept that recommendation, and insisted on the Parliamentary Committee preparing a scheme themselves, without delay. If the present report accentuated the difficulties of the question, it was not the fault of the Parliamentary Committee. The first thing about the report was that it did not favour proceeding with the present Purchase Bills. The Committee, firstly, were unwilling to commit the ratepayers of London to a headlong purchase on open arbitration; and, secondly, they had a doubt as to the expediency of severing the outside authorities from the general scheme. On the question of purchase, he might say that the arbitration clause was framed with a view to safeguard the ratepayers from loss; but the clause in its entirety was not accepted by the Committee of the House of Commons, because they believed that it would hamper the Arbitrator. So everything was left open to his discretion. He had been asked by a Progressive member: "If you criticize our arbitration clause, what substitute have you to bring forward?" He was prepared to say that the effect upon the rates of compulsory purchase had never been properly understood, and that the result of purchase by agreement had never been tried. Arbitration involved long and expensive conflicts, which purchase by agreement would avoid. The main question to consider was, What is the best system for controlling the Metropolitan Water Supply? There appeared to be three systems. The first he might call the provincial system, under which the corporation acquired the waterworks and managed them, agreeing with the small outside areas to

furnish them with supplies. Then there was the system which he might call the separatist system, whereby the London County Council, as the central authority, might acquire all the Metropolitan water undertakings, not for the purpose of placing themselves in the position of the provincial corporation, but of dividing up the water areas, giving certain portions to the outside authorities, with exclusive power to control those portions. A third policy consisted in the formation of a Water Trust, under which all parties in the water area secured representation and got equal rights. This latter system was now submitted by the Parliamentary Committee as being the best for London. With regard to the provincial system, he would say nothing beyond this, that it did not seem acceptable to the Greater London authorities; but as to the separatist system, which was favoured by the Progressive party, he could only say that it was not in accord with the principles laid down by Parliament, nor with the past policy of the Council. The Trust system proposed by the Committee had many advantages, and got over the difficulties of the other system. First of all, it was a sort of half-way house between the subordination of the outside authorities which was involved by the provincial system, and the total severance of the outside areas comprised in the separatist system. In the next place, this policy was in accordance with the principle laid down by Parliament—and by Sir William Harcourt—in favour of a single authority. Then, again, it did not involve the Council or the outside authorities in any future difference as to carrying out the agreement. Besides this, it was a policy of unification; and unification had been one of the main arguments brought forward in favour of the acquisition of the water supply Adopt this system, and the Council would create at once an authority representing the consumers of the whole of the Metropolitan water area, and would be able for the first time to meet the Water Companies on united ground.

Mr. T. M'Kinnon Wood moved the following amendment to the first recommendation: "That Her Majesty's Government be asked whether they will promote or assist legislation dealing with the Metropolitan Water Supply on the following lines: That the entire control of the water supply within the area of the County of London shall be in the hands of the London consumers, directly represented by the County Council in conjunction with the City Corporation; that the consumers in the Metropolitan water area outside the county shall not be denied, or deprived of, similar rights in their respective areas; and that the purchase price of the existing water undertakings shall not be assessed under the provisions of the Lands Clauses Consolidation Act, but shall be based upon the fair and reasonable value of those undertakings, due regard being had to the rights, special circumstances, and obligations of the Companies; also that the Parliamentary Committee be instructed to report as to the reply of Her Majesty's Government immediately after the recess." He said it was a mistake on Mr. Harris's part to say that the Progressive party had never considered the financial result of the policy of severance. That matter had been fully discussed by the Water Committee, and by those who were responsible for the action of the Council at the time the agreement was made with Surrey. Nor was it correct to say that this was the sole water policy of the Progressive party. The position was, perhaps, best defined in the fifth section of the report of Sir Matthew White Ridley's Committee, which laid down that, in the event of purchase by the new authority, power should be given to that authority to negotiate with the outside authorities for the purchase of certain portions of the works, and possibly some of the sources of supply, such as it might be practical and advantageous to sever from the general rule. The Progressive party went as far as that, and no farther. He must also object to the attempt made in the report to give the scheme the appearance of being conceived in the spirit of Sir William Harcourt's Committee. That Committee only provided for a Water Trust in the absence of a central municipal authority to which the functions could be committed. The Committee carefully left out this reference to the central authority, which now existed in the County Council. The first thing that struck him in looking at the policy propounded by the Committee was that it was a broken-backed policy. The second recommendation was not consistent with the first. The Committee first asked Parliament to create a Water Authority, and then they suggested that the Council should reopen negotiations for the purchase of the water undertakings. This would place the Council in a ridiculous position. When this vague and indefinite authority was constituted, it was to be given the power to purchase by agreement; and if they failed to come to an agreement, then they were to go to Parliament for compulsory powers. Such a proposal could never be considered as a serious or adequate treatment of the question. On reading the report, one would think the Committee held a brief for the outside authorities. Every point in the report went towards swelling the outside authorities, and belittling not only the County Council but the whole of London. He would rather leave the Water Companies as they were, with the Local Government Board and the Council looking after them, than see created a great Trust which would never represent the true interests of London. Against this policy of the Parliamentary Committee what did his amendment propose? It was, at least, simpler than Mr. Harris's scheme, and laid down broad general principles. What the Progressive party wanted first of all was direct popular control; and this was not provided for in the constitution of the Trust. Their second principle, as laid down in his amendment, was to acknowledge the rights of the outside authorities. The Council had before them a clear issue. On the one hand, they had a proposal to spend the wealth of London on a hybrid authority that would be absolute in power, but would not represent them; on the other, the Progressives declared that they would stand firm to London, and that, whatever decision the Council might arrive at, they would never consent to what they regarded as a great betrayal.

Mr. E. Spicer seconded the amendment.

Lord Welby found himself in a difficulty, as he liked neither the recommendation nor the amendment. He said it was natural and reasonable that both parties should wish to present their views to the Government; but there was a consideration which was paramount even to the presentation of those views, and that was the interests of the consumers. It was clear that, if the battle was to be fought out on the recommendation and the amendment, a party division was inevitable. This would lay them open to the charge that they had somewhat subordinated the interests of the consumers to party exigencies, and that the result was a decision of the matter by half of the Council. The Government would at once see that they could not rely upon the co-operation of the whole Council, and would found on that fact an easy plea for delay in undertaking a most difficult and thorny task. The present Government had the prospect of power for the next six years. The Progressives would be sorry to see the water question hung up for that period. If both parties asked the Government to legislate, and if the Government leant rather to the Moderate view, he trusted the Progressives would not adopt a *non possumus* attitude. He had hoped the Council would find some means of passing a unanimous resolution, and would be able to assure the Government of their united co-operation in any measure that would secure for the consumers their proper share and interest in the supply. He feared, however, it was too late now to pass any such resolution; but he wished it were possible, even at the cost of some delay. On the principle that "light gives counsel," a little delay might bring light to them. He did not approve entirely of either policy now before the Council; but, on the whole, he had come to the conclusion that he would rather support the amendment, feeling that, if he was to err at all, he would rather err in good company.

The Earl of Onslow said he felt certain that the amendment would be rejected by this or any Government as an extravagant and profligate proposal. He hardly knew why it was considered necessary to draw up such a lengthy conundrum to put to the Government. It seemed to him that it would have been sufficient if the Progressives had asked the Government to promote the defeated and discredited Water Bills, because the amendment really embodied the whole ground of those Bills, adding to it one more dangerous and extravagant proposal—viz., that they should cut off from their area, which was now supplied by the eight Companies, all that part in which the future profit was to be gained. Instead of simplifying and unifying the system of supply, if the proposal made in the amendment were adopted, they would have at least seventy or eighty separate authorities, with all the inevitable and attendant expenses. The policy of the Separatists in this matter was that of "killing the goose that laid the golden eggs." He was entirely at one with Mr. Wood in desiring that the people of London should have their proper and due influence in the control of the water supply. The Progressives had challenged them to produce a policy; and they had not shrunk from the challenge. The object of the Progressives in asking for that statement of policy was that they recognized that the Bills they promoted in the last session of Parliament had no shadow of a chance of passing; and now that their policy had been produced, the Moderates were not met in any spirit of compromise, with a desire to present a united front to the Water Companies, but with the stale arguments and the old proposals contained in the Bills of last session. If they were going to ask the Government to deal with the matter, they must not dictate, but leave it entirely in their hands, after indicating what the general views of the Council were.

Mr. W. H. Dickinson (the Deputy-Chairman) admitted that the Committee had made an honest attempt to settle a difficult question; but he thought they had not appreciated the far-reaching effects of their scheme. There were in London now four different central bodies. Were the Council going to add a fifth? Lord Onslow had said that the Separatists were going to "kill the goose that laid the golden eggs." He (Mr. Dickinson) could not help thinking that the whole question involved now depended on the true appreciation of that question. Lord Onslow was absolutely wrong in thinking that there was any goose that laid the golden eggs. To show this, he would trouble the Council with a few figures. He would first notice that while the profits laid out on water inside London were 76 per cent., they were 153 per cent. outside; which meant that at the present moment London water consumers were paying £122,000 for the benefit of water drinkers outside. He would surmise that the scheme of abandoning the Thames supply and going to Wales for a new supply was to be carried out. The figures he would place before the Council were based on the understanding that 420,000,000 gallons of water were required both outside and inside, and that the population would be 11,250,000—that was to say, 6,000,000 inside and 5,250,000 outside. Now, 6,000,000 people would require 210,000,000 gallons, and 5,250,000 people, 184,000,000 gallons. This quantity of water could be obtained from two different reservoirs in Wales. The cost of providing London with water would be £19,000,000, and outside London £15,000,000—a total of £34,000,000. If the County Council did the work alone for their own area, it would require a charge of £168,000 on water consumed; but if it was done by a Water Trust, getting the whole of the water at a cost of £34,000,000, it would require £1,041,000. London would have to pay £373,000 a year because it would have a Water Trust. The answer to that would probably be that the rateable value would be growing outside. This question must be examined. What was the condition of affairs in London? The growth of the rateable value of those parts of London which were supplied by the Water Companies was increasing three times as fast as the increase in the number of houses; whereas the rise in the rateable value outside London was growing to be little more than equal that of the number of houses. Therefore the position never would be reached in which the rateable value of the property outside London could have its fair share. In order to show that the march of events he foreshadowed was right, he would look into the profits of the Water Companies. Since 1871, these had increased by 22 per cent., whereas outside they had increased by 12 per cent. It was clear to his mind that the proposal of a Water Trust was simply setting up a water company for a larger area than had existed up to the present. If they, as Progressives, were convinced that the financial results of a Water Trust would be disastrous, they had a right to say they would not participate in such a scheme, which was the worst of the three schemes that had been put forward. It was a betrayal of London; and if the Council voted for the Water Trust, they would vote against the financial interests of London, and would not be carrying out the purposes for which they had been elected.

Mr. H. Clarke opposed the amendment.

Mr. Idris, who continued the debate, was frequently interrupted with cries of "Vote, vote."

After the speaker had proceeded for a short time, the closure was

moved and carried, and the amendment was put, when there voted for it 56; against it, 49—majority, 7. On the amendment being put as the substantive motion, a division was taken, when there voted for the resolution, 56; against it, 43—majority, 13.

Mr. HARRIS asked that he might withdraw the second recommendation.

Mr. J. STUART, M.P., objecting,

The CHAIRMAN ruled that when one member objected, leave to withdraw could not be given.

The recommendation was then agreed to, with the omission of the words "pending the constitution of such authority," and the substitution of the words "Water Committee" for "Parliamentary Committee." The third recommendation was agreed to without discussion.

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The Council have incurred an expenditure of nearly £900 over Colonel Ducat's inquiry as to whether a water-closet flushing-cistern should hold two or three gallons. The original estimate was £250; and the Public Health Committee asked that payment of the balance should be authorized.

## LIVERPOOL CORPORATION WATER COMMITTEE.

### The Protection of the Officials Against Unreasonable Members.

There was a discussion at the meeting of the Liverpool Corporation Water Committee last Tuesday upon a question which concerns many other similar bodies—viz., the protection of officials against members of the Committee who are given to pestering them and wasting time by making frivolous inquiries. In March, 1877, a resolution was passed by the Committee, "That in future any communication between individual members of the Water Committee and the Water Engineer as to matters within the province of the Committee be made through the Committee or the Chairman." This mode of procedure has not been strictly adhered to; but it has lately been thought fit—and apparently with good reason—to apply it to Mr. Beloe. This gentleman, in consequence, felt aggrieved; and at last week's meeting of the Committee, he moved that the above-quoted resolution be rescinded. He said that he and other members had been in the habit of applying for information without going through the form and ceremony prescribed by the resolution; and until lately information had never been refused. But for his special benefit, this old resolution had been dug up. No other Committee of the Corporation had a similar rule; and there was nothing in the business of the Water Committee which required that secrecy. If such a resolution was necessary to the conduct of the business of the Committee, it ought to be included in the standing orders of the Council. It was an objectionable course to have such a resolution hidden away, and brought out again for the benefit of the Chairman, or any other member who was in authority, while favoured members could get whatever information they wanted. In their case, the resolution was allowed to remain a dead letter. Mr. Kearney seconded the motion; claiming that, as representatives of the ratepayers, one member of the Committee had as much right to any information as another. The Chairman (Alderman Radcliffe) remarked that he was a party to the passing of the resolution in 1877; and the reasons which then made it advisable seemed to him to be still in existence. It was a resolution to protect the officials of the Corporation. There were gentlemen on the Council who were not altogether reasonable, and little knew the labour which they entailed upon the officials. As an instance, he might mention that Mr. Beloe had written to him in reference to certain information which he thought he was entitled to have. The consequence was these [the Chairman held up a bundle of large-sized papers closely written upon]. It was voluminous; and the officials were kept at the office until eleven o'clock on Saturday night preparing it. He, as Chairman, and Mr. Burgess, as Deputy-Chairman, had a certain amount of responsibility in seeing that the routine work of the Water Engineer's office was not interfered with. There was no intention whatever to impose secrecy; the point was to ensure that the ordinary routine business of the department was not interfered with. Mr. Beloe said the Chief Clerk (Mr. Annett) told him that he could provide him with the information he required in about five minutes, as he had already prepared it for another member of the Committee. The Chairman said it was Mr. Annett who prepared the voluminous report which he held. Alderman Hughes thought they ought to strongly protest against a member frittering away the time of the officials in obtaining frivolous information which could do no good, but yet entailed arduous work in overtime, to which they did not wish their servants to submit. He thought it was high time they put their foot down, and not be parties to a system of that sort. In this particular instance, it was labour thrown away, because the information obtained served no public purpose. Other members concurred in these remarks; and, in reply to a question, Mr. Pierce (of the Town Clerk's Department) said the information contained in the papers referred to by the Chairman was all new, and was got out for the purpose of Mr. Beloe. On the motion being put to the vote, it was rejected by 3 votes to 14.

## PLYMOUTH WATER SUPPLY.

### The Remuneration of the Water Engineer for the New Works.

The question of the remuneration of the Water Engineer (Mr. E. Sandeman) for extra services in connection with the important new works which are being carried out by the Water Committee of the Plymouth Corporation, was under the consideration of the Town Council yesterday week. The Committee recommended that the sum of 300 guineas should be paid to Mr. Sandeman, "in consideration of the services rendered by him in preparing the parliamentary plans and sections, and also in carrying out the works in connection with conduits Nos. 1 and 2 authorized by the Plymouth Corporation Water Act, 1893." The resolution went on to say that the consideration of any further remuneration for carrying out works at the Burrator reservoir was deferred until the completion of the works. The Mayor (Alderman Bond), in moving the resolution, stated that when Mr. J. Mansergh was appointed Consulting Engineer, he was so satisfied of the ability of Mr. Sandeman, that he agreed to accept a commission of 1 per cent., instead of the usual 5 per cent. By this means, the Committee saved £4000. When Mr. Sandeman was appointed, there was no conception that they would be so soon in a position to carry out so great a work; and the plans which he prepared were of the most perfect and elaborate kind. As to the future, it would be for Mr. Sandeman to show that he was as good a contractor as he was an architect. Mr. S. J. Page opposed the resolution, on the grounds that the latter portion of it foreshadowed a still larger vote on the completion of the works now in hand, and that the system of paying officials for extra work would be attended by serious consequences if it were applied all round. The Mayor, replying to these and other objections, said that Mr. Mansergh did not receive any remuneration for the work of laying the pipe-line; while as to the plans, their preparation, if placed in the hands of a draughtsman, would have cost £1000. The Corporation were bound to be just. Since his appointment as Water Engineer, Mr. Sandeman had secured an additional return in the form of revenue from old customers, which more than paid his salary; so that by his energy he had really made a present of his salary to the town. Within the last twelve months, Mr. Sandeman had had an offer of an appointment at £900 a year; but when it was represented to him how disastrous it would be if he left the Corporation "in the middle of the stream," he readily declined the offer without even "sounding" the Committee as to future prospects. The recommendation was adopted by 31 votes to 5.

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**Harrogate Water Supply.**—At a public inquiry at Harrogate last Tuesday, Mr. W. F. B. Clarke, of the Local Government Board, received evidence as to an application by the Town Council for sanction to borrow various sums of money for several purposes. One of the amounts was £4000, which it is proposed to spend upon the construction of new storage reservoirs of a capacity of 300,000 gallons.

**Possible Disturbance in the Coal-Mining Industry.**—Lately there have been noises in the air which seem to indicate another serious strike in connection with the coal-mining industry; and the prominent personages allied to the Trade Unions appear anxious that this should be thoroughly understood. For instance, Mr. B. Pickard, M.P., the President of the Miners' Federation, speaking recently at Barnsley, referred to Messrs. John Brown and Co., of Sheffield, having accepted the North-Eastern coal at 7s. per ton of 20 cwt. (6d. below the price per ton paid last year). He said he regarded this action as showing a violent desire to bring down prices; and he wished coalowners to thoroughly understand that ruinous competition and forced reduction of values would not exert pressure on the Miners' Federation of Great Britain to accept reductions of wages. Mr. Ben. Dean, J.P., speaking at a miners' meeting at Brownhills, last Tuesday, reminded the meeting that the arrangement made eighteen months ago was hastening to a close, and those miners who did not belong to the Trade Unions by the end of the present year would find it very difficult to join thereafter, for the Federation was bent on altering the conditions whereby men only thought of Trade Unionism when it suited them individually. Everything possible would be done to avert another dispute; but he might say that they had made up their minds that the 30 per cent. basis of 1888 should be the point below which wages should not go.

**The Suggested Inquiry into the Water Supply of Shrewsbury.**—At the meeting of the Shrewsbury Town Council yesterday week, the Water Committee submitted the draft of a letter to the Local Government Board in reference to a memorial which was recently sent to the Board by a number of ratepayers, in which, it will be remembered, it was asked that an inquiry should be held in reference to the supply of water for the town, which was said to be very unsatisfactory. The Committee's letter explained that, during the last few years, three schemes had been brought before the Council, and met with more or less approval from the members; but all had been condemned by the ratepayers, and the question was still unsolved. The water pumped from the Severn was liable to cause disease if used for drinking purposes; and the supply of drinking water from the wells had, therefore, been largely increased of late years by the erection of additional stands in the streets. The present water-works needed repair; but the Committee had not spent much upon them in consequence of the new schemes which had been under consideration, and all of which would necessitate entirely new works. The Town Council agreed with the memorialists that a Government inquiry into the whole matter should take place; and, after much discussion, they approved of the letter to the Local Government Board. It was agreed to ask for authority to borrow £2000 to improve the present supply of drinking water.

**The Prevention of Lead-Poisoning by Water Supplies.**—At a meeting of the Association of Yorkshire Students of the Institution of Civil Engineers yesterday week, Mr. O. J. Kirby, the Water Engineer of Batley, read a paper on "Waste of Water due to Lead Contamination, and Means of Preventing such Contamination." He mentioned that a newspaper correspondence on the subject of lead-poisoning had led to an increase in the consumption of water at Batley by more than 100 per cent., mainly through people allowing taps to run before drawing water. The author dealt with the various means of preventing the presence of peat in water, which was said to be the chief cause of the action upon lead; and he described his method (with that object in view) of preventing the first rush of storm water into the reservoir, by means of self-closing flood-gates. Mr. T. Hewson, the Borough Engineer of Leeds (who presided), said that the Leeds water, though containing a certain quantity of peat, was reported to have no action upon lead; and hence no special measures were considered necessary. Mr. M. Patterson referred to the objections to the use of other materials than lead for service-pipes, and said that English-made lead, containing a small proportion of silver, was far less readily acted upon than foreign leads. He also mentioned cases where, owing to the arrangements of the reservoirs, the author's method was inapplicable. In the case of Loch Katrine water, six months' exposure was found to stop all deleterious action on lead. Several other members took part in the discussion.

## NOTES FROM SCOTLAND.

From Our Own Correspondent.

*Saturday.*

After having buzzed for several years around the subject of the Corporation acquiring the undertaking of the local Gas Company, Bailie Lawson, of Stirling, has at last screwed up courage to table a definite proposal for the opening of negotiations. The situation has been rather forced upon him, for there is a movement with regard to the introduction of electric lighting in the town. Stirling has been selected by a Company as a likely place upon which to make an onslaught; and the subject of making terms is before a Committee, of which Bailie Lawson is Convener. I am not without suspicion that the sudden interest which Bailie Lawson has manifested in the procuring of a gas transfer, may be due to a desire to lower the terms of the electric lighting prospectors. His attitude towards the Stirling Gas Company has completely changed since he last addressed the Council on the subject. Then he was all severity; now he is all fawning and smiles. He moved the appointment of a Committee to consider and report as to the advisability of the Commission acquiring the gas-works for the burgh, and for the purpose of meeting with the Directors of the Gas Company with reference thereto. Having mentioned that in the neighbouring burgh of Alloa, the price of gas had, since the Police Commissioners took the supply into their own hands in 1878, been reduced from 4s. 7d. to 2s. 10d. per 1000 cubic feet, while the output had been more than doubled, he said that these things spoke for themselves; and he went on to counsel that they should approach the Directors in a friendly, straightforward, and honest way, and ascertain what they would sell for. The Directors were townsmen of their own, and had the same interest in the prosperity of the burgh. Provost Kinross, who is Chairman of the Gas Company, was present, and presided at the meeting of the Police Commissioners; and Mr. Macfarlane, another Director, was also there. But, in these altered times, there was no insinuation, such as I have seen in similar circumstances, of the Directors of the Gas Company being the enemies of the community. This would be a cheering state of matters, if there were a guarantee or a likelihood of future proceedings being followed out in the same spirit; but I fear that is wanting. I do not object to Bailie Lawson advising that the Gas Company should be approached in a friendly and straightforward way; but when he adds "honest" to his other conditions of mind, I feel that if I were a Director I should be inclined to regard the Commissioners as being in the position of protesting too much, and therefore to be suspected. However, the matter has not yet gone far. The Directors, while they may meet the Committee which the Commissioners appointed in a courteous and friendly spirit, need not give away their position. Nothing can be done now for nearly a year. My advice to the Directors of the Gas Company would be not to repulse the Corporation, nor do anything to provoke needless acrimony in any negotiations which may follow; but that when they come to be waited upon by the Committee of the Corporation, they should remember the direction given by the poet Burns to "gently scan your brother man," and not be too confiding until they are satisfied of the *bona fides* of the movement.

Objection has been lodged with the Town Clerk of Dunfermline to the adoption of the Burghs Gas Supply Act by the community. There were two sets of objections. One, signed by 23 ratepayers, being merely a request for the taking of a plebiscite on the question of whether they should purchase or not, was ruled to be incompetent; but the other, signed by 20 ratepayers, was in proper form, and objected to the adoption of the Act until a plebiscite should be taken. This is accordingly to be done. I understand that what has led to the production of these objections is chiefly the extraordinary trumpeting which there has been for the past two weeks, of the Edinburgh electric lighting installation. The ratepayers have begun to think that, were they to adopt the Gas Act and proceed to a transfer, they would be hastening the burgh to its ruin. How foolish! Even supposing that the Edinburgh electric lighting installation were the success which is claimed for it, there is no reason to suppose that Dunfermline would have a different experience from that of other smaller towns which have introduced electric lighting. Besides, I could understand occupiers or owners of property looking askance at a gas transfer, in view of the probability of their adopting electricity, and a contingent rate being imposed for the support of the gas undertaking; but that, according to the Lockerbie case, would be an erroneous fear, because the rate cannot be imposed unless in emergencies—what must take place is the raising of the price of the gas. The advent of electricity would therefore not affect those who might give up the use of gas; it would, were the price of gas raised, be only those who kept it on who would suffer. Nearly all of the objectors are working men; belonging to the class whom Provost Walker, of Dunfermline, spoke about recently as burning about a pound's worth of gas in a year. They need have no hankering after electricity. To them, occupying houses of from £10 to £15 rental, a gas contingent rate would only mean from 10d. to perhaps 2s. added to their taxes; whereas, were they to introduce electricity, according to experience elsewhere, the increase to their expenditure would be about £3 a year. These things should be put before the ratepayers before the plebiscite which the Law Commissioners of the Corporation are arranging for is taken.

This is the season when pantomime and burlesque hold the boards at our public places of entertainment—when the good fairies, flying in the face of all the recognized laws of Nature, lavish untold possessions upon a favoured few; and young, or thoughtless, people believe it all to be true, until they enter the real business of life, when the awakening comes. Was it something of the nature of a burlesque which Mr. Mackenzie, the Convener of the Electric Lighting Committee of the Edinburgh Town Council, laid before the Council on Tuesday? Summarizing his remarks, his statement amounted to this, that up to the present they had expended upon the electric lighting installation £138,000, of which the station cost £20,000, exclusive of £9681 spent on the site; and that the original estimate for the scheme, other than the site, was £70,000. On account of extensions, however, that sum had been considerably exceeded, although it was believed that the portion embraced in the original scheme would be completed, when all the accounts were paid, for several hundred pounds less than the estimate. It was proposed to spend £40,000 more on further extensions. They were able this year to pay their full complement of the sinking fund, as well as their interest and all their expenses; and they anticipated a balance of about £3000 besides. They were to be allowed to carry in their low tension mains a pressure of 500 volts, which meant that those mains would now be able to supply a radius of two miles instead of one mile, thereby quadrupling the capacity of the mains. With regard to their policy for the future, he had received a communication from Professor Kennedy, who anticipated that next year there would be a revenue of £28,000, and that the total expenditure, including charges on capital account, would be £18,000; leaving them with a balance in hand of £10,000. If, at the end of next year, they found themselves in as good a position as they anticipated by this report, he hoped the Council would see the wisdom of reducing the price of the current from 6d. to 5d. per Board of Trade unit, of reducing the cost of the street lighting from £20 to £18 per year for each lamp, and of abolishing meter-rents. He was perfectly certain that, in pursuing this policy, they would be doing the best thing for the undertaking. He would be very sorry if this great extension of the electric light were to have such an effect as to make the gas a non-paying concern; and he did not believe it would do so. Bailie Kinloch Anderson (who is Convener of the Works Committee of the Gas Commission) seconded the adoption of the report. He was glad to find that Mr. Mackenzie, even with his scientific knowledge in respect of electricity, admitted that gas would still have a place in the running. It was exceedingly pleasing to him, as it must be to a number of others who stood out so strongly for the Corporation doing this work themselves, to find that the undertaking had turned out so well. The proposals were agreed to. Now, all this may be as it is set forth; but it reads like a dream, when the experiences of other places are remembered. It would seem as if Professor Kennedy, or Mr. Mackenzie, or the Corporation, were the good fairy of Edinburgh, who had resolved to confer favours which, in other places where business methods only prevailed, and there had been nothing but disappointing returns at first, were not known. If that be so, it may account for one or two things, matters of detail, which the fairies never enter into—such as a definition of what is meant by "next year;" a statement of how much has actually been received, and whether the great surplus which is to be realized is actually in course of formation in the till, or is simply a calculation from the reading of the station meters; and the like. These are questions which may affect the balance-sheet considerably whenever it may be presented. I do not doubt Mr. Mackenzie's word; and I have no reason to be otherwise than delighted if he should be found to be right at the end of his year. But I am, from month to month, in a position to know the actual output and the actual drawings of the Gas Commission; and I see no reason why the electric lighting department, if it is the extraordinary success it is said to be, should not periodically report their progress. My mind is still open, because I am waiting for the figures.

How great a descent it is in this matter from Edinburgh to Glasgow, where, in the absence of any supernal power, the authorities are involved in a constant struggle with facts and experiences of a most stubborn nature. No magician's wand waves over them; and if they wish to keep themselves abreast of the times in things electrical—as they do wish—they must needs acquire information as to how to proceed, by the more ordinary and grosser methods of sending out deputations. The Town Council wrestled with two such subjects on Thursday. They were not stupendous questions, yet the human intellect, unaided, found it necessary, as one of the speakers said, "to philosophize on this matter for a moment." I am afraid his philosophy did not help the Council much, for the business was very quickly disposed of, whether well or ill, immediately afterwards. The net result of the business was that the Council—though grumbling that the Convener of the Sub-Committee on Electric Lighting had, without the consent of the Council (as must be done in cases of emergency) appointed himself and the Convener of the Gas and Electric Lighting Committee to attend the conference in London on Wednesday—homologated his action; and that the same Sub-Committee having submitted a minute stating that they had appointed a Special Sub-Committee "to take such action as they might deem expedient, in conjunction with a Special Sub-Committee of the Watching and Lighting Committee, appointed on the 18th inst. to consider the question of the electric lighting of the city, and particularly the kind of lamp to be used," they were instructed to take it back and amend it. Somebody had said something about a deputation going to Blackburn to see the lamps in use there; and this started the notion that the Special Sub-Committee were getting power under the minute to roam anywhere in search of information. That was more than could be tolerated, and although it was explained that no such object was in view, as the Committee proposed to experiment with different lamps in Glasgow, the Council were apparently doubtful on the subject, and sent the minute back to be amended so as to say what they did mean.

It is a curse of small places that so many jealousies exist that public men cannot take an unbiassed view of questions which come before them. An instance of this nature has occurred in Rothesay. There the gas-works are about to be transferred to a new site, which has been secured, and upon which there are mill buildings, some of which require to be taken away and others to be adapted for the purposes of a gas-works. Mr. A. Gillespie, of Glasgow, is the Consulting Engineer. The Committee of the Corporation divided the work at the new site into four sections, and advertised for offers. On the 9th inst. they reported to the Town Council that on Nov. 15 they agreed to let sections 3 and 4 to Mr. W. Hunter, whose offer was to give £150 for the material, and to execute certain work for £200. They also resolved that the materials in sections 1 and 2 should be disposed of in small lots. On Nov. 22, however, they met and rescinded their resolution with regard to sections 1 and 2, and agreed to accept an offer of £200 from Mr. G. Halliday for the whole of the materials. When this was reported to the Council, objection was taken to the Committee's work, on the ground that it had been irregular; and a motion was made against approval of the action of the Committee. The sale, it was maintained, should not have been by private bargain; and it was further stated that the price to be paid was about half what would

have been realized if the lots had been small enough to enable local tradesmen to offer. In the discussion which followed, the main element which moved the objectors was the local tradesman question. It was of little consequence to them that the Convener of the Committee was able to tell them that, the site and buildings having cost £2500, they had, by the sale of materials, reduced the cost to the burgh to £864, for which sum they had nearly two acres of land. This is certainly good management; and if the other parts of the work—the transfer of the plant, and the like—be done in the same reasonable manner, the community of Rothesay, albeit a few tradesmen may be disappointed, will have occasion to be gratified with the services rendered by their Manager (Mr. Ballantyne) and the Committee. The Committee had power to sell the materials, which consisted of stone, slates, wood, &c.; and so the Council could do nothing in the matter, and after having their say the objectors withdrew their motion.

The holders of bonds to the amount of £5000 over the harbour of Arbroath, part of whose security is the gas profits, and who say that the Gas Corporation, by reducing the price of gas, have taken away the gas profits and so deprived them of their security, had a conference with the Town Council on Monday. On behalf of the bondholders, it was submitted that the Town Council and the Gas Corporation being the same body, they had no right to take away the gas profits; and when, as a Gas Corporation, they did so, they must, as a Town Council, have known that they were cutting off the possibility of their fulfilling their obligations. It appears that the security which was given was that the surplus revenues of the town and the surplus gas profits, "so far as could be legally done," to the amount of not more than £250 a year, were pledged. Under their Act, the Gas Corporation are required to apply half their profits in the abatement of price; and the other half they must pay over to the Town Council, to be applied by them to public purposes. The half of the gas profits could thus be given; but the Gas Corporation is so financed that the profits do not, in any year, amount to more than a few pounds, and the half of that is unequal to paying interest upon £5000. It is, no doubt, hard upon the bondholders to be deprived of interest, and of the prospect of repayment of their capital; and there may be some question about the honour of the transaction, as to which it is explained that when the money was borrowed—in 1877—and for some years afterwards, the harbour was easily able to pay its way, and meantime the price of gas was reduced without any notion of defrauding the bondholders. While there was a disposition shown on the part of the Town Council to raise the money in some way, none of the Councillors went so far as to admit that what one of the bondholders proposed—viz., that the Gas Corporation were bound to raise the money—was feasible. Apart from every other consideration, the question, so far as it affects the Gas Corporation, is a simple one. They are obliged to fix the price of gas at a figure which, as near as can be estimated, will meet all cost of production and establishment charges. They cannot raise money avowedly for other purposes; and thus the obligation to the bondholders lies, not upon the Gas Corporation, but upon the Town Council—that is to say, on the rates, and not on the price of gas.

The Forfar Gas Corporation have been spoiled by the late municipal election. They had a stormy scene on Monday night over a proposal by a recently admitted member to curtail the powers of the Gas Manager. The proposal was that the power of dismissing men at the works be taken from the Manager, and vested in the Committee, and that Preston, the workman who was dismissed some time ago, should be reinstated. In the course of the discussion, the author of the proposal—a labour representative—altered his motion to giving the men who might be dismissed by the Manager a right of appeal to the Corporation. This is a right which, it was pointed out, the men had all along had; and the motion, in its altered form, was therefore unnecessary. It was accordingly rejected by the Corporation; only two members voting for it. The re-instatement of the dismissed man was lost sight of. Having finished that business, the Corporation took up the subject of an inquiry into the recent explosion at the works, by which the Manager (Mr. Forbes Waddell) was injured. It was reported that an Insurance Company, though explosions are exempted in their policy, had paid them £65 12s. 6d. to cover the loss sustained. The Corporation resolved to ask the Board of Trade to institute an inquiry into the occurrence; and, failing their taking it up, that an expert should be called in to report upon it to them. I understand that Mr. Waddell, having now recovered from his injuries, has been at work for three weeks; and that he is desirous an inquiry should take place.

Messrs. Donald Clerk and Son and the Barrowfield Iron-Works, Limited, have entered into contracts with the Glasgow Gas Trust for the supply of malleable iron plates and other ironwork required for the new holder at the Tradeston Gas-Works.

On Thursday morning five persons were found to be suffering from symptoms of poisoning by gas, in a house in Airdrie. They have now recovered. So far, although searched for, no damaged gas-pipe has been found.

The employees in Edinburgh of the Edinburgh and Leith Gas Company held their annual festival last night, under the presidency of Mr. R. Mitchell, the Engineer and Manager. Mr. Mitchell, speaking of the advance of the electric light, said that notwithstanding it, they recently sent out from the Edinburgh works, in one day, 5,600,000 cubic feet of gas, which was a record output for them—a figure which was never reached, even before the introduction of the electric light.

The Lord Provost of Glasgow (Sir James Bell, Bart.), in his annual statement on the municipal trusts of Glasgow, to which reference was made in last week's JOURNAL, has the following remarks on the public lighting of the city: "A year ago, I mentioned that an experimental installation of the Welsbach incandescent gas-light, consisting of ten lamps, had been fitted up in St. Vincent Street. This was so successful, and the results so satisfactory, that the experiment there commenced was extended during the year to Gordon Street, George Street, Blythswood Square, Bain Square, and Bridgeton Cross, until, by the middle of April, 82 incandescent burners had been fitted up. With the exception of Bridgeton Cross, where the excessive vibration [owing to the tramway and underground railway traffic] is very injurious to the mantles, the experiment has been sufficiently successful to warrant a further extension; and Bridge Street and Eglinton Street [a continuous line of thoroughfare nearly a mile long] will shortly be lighted with the Welsbach burners throughout their entire length. It has been shown that the illuminating power is much in excess of that produced by ordinary gas-burners, and the cost per candle power per annum greatly less. During the past year, also, a considerable addition has been made to the number of public street-lamps, principally within the recently annexed districts. Twelve months ago the number in use throughout the city was 13,243. There had been added within the year, taking, in addition to the new lamps erected, those which were situated in streets assumed as public, 429, making the present aggregate number 13,672. Additions are being made this year as required, where new streets are opened up or additional buildings erected. The number of common-stair lights has also largely increased, 1086 having been added to the number, for the charge of which the Lighting Department is responsible; making the present total 38,139. There are 112 electric street arc lamps now in use; being an increase of nine since last year—eight in Argyle Street and one in Trongate. These additional lamps were among those originally arranged for; but erection was delayed by the operations of the Central Railway Company. There are still four to be erected when the railway works permit.

## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Dec.* 21.

**Sulphate of Ammonia.**—The slightly better feeling referred to last week has not been maintained. There has been a fair demand. But increasing supplies have been more than sufficient to meet it; and prices have, in consequence, again become rather easier. The closing quotations are £8 10s. to £8 12s. 6d. per ton f.o.b. at the usual shipping ports. In the forward position, buyers expect to purchase at so small a premium on spot values as to offer little inducement to sellers to engage themselves in advance; and business actually done has been comparatively small.

**Nitrate of Soda** is a shade firmer. There has been more doing on spot, at 7s. 6d. for ordinary quality up to 7s. 9d. for refined. The renewed efforts to effect a combination of producers have also induced a larger business in cargoes afloat, at 7s. 6d. to 7s. 7½d. for ordinary quality, and up to 7s. 11d. for refined—the latter for October sailing.

LONDON, *Dec.* 21.

**Tar Products.**—Your correspondent, Mr. Simon, will be gratified to see, from quotations below, that crude naphtha has now responded to its parity value with benzols. It has been somewhat tardy in doing so, as is invariably the case with crude materials, when sudden and unexpected variations occur in finished products; and the same may be said if the position were reversed. Mr. Simon treats the question as if crude naphtha were entirely composed of benzol, which, of course, is not the case. A crude naphtha showing 30 per cent. at 120° C., would in all probability give about one-third of its bulk in benzol; the balance consisting of toluol, solvent naphtha, and a large quantity of dead oil or light creosote. It is quite correct that benzol has advanced to the extent mentioned by Mr. Simon. But, on the other hand, solvent naphtha and creosote have remained quite stationary; and as these form the greater bulk of the crude naphtha, it will readily be seen that the advance in value of the latter article is not so great as Mr. Simon would make out. It is, of course, very difficult to obtain accurate values for crude naphtha, as the qualities of the article vary so very much, even when the percentage is the same at 120° C.; so that any average prices given should certainly not be taken as a basis for a contract without further particulars being given.

Benzols are not quite so strong; indeed, buyers for next half-year's delivery will not pay within several pence of prices quoted a week ago. Solvent naphtha is steady; but it has not participated in the improvement of benzols. Heavy naphthas are also in fair request. There is a little better demand for creosote and common tar oils. Anthracene is firm; and it is commonly reported that stocks, which have accumulated for several years, have now been cleared out. Carbolic acid is in good request at an increased price, owing to the Japanese making important purchases—it is said for explosives. Pitch is only moderate; and buyers are waiting to see lower prices. There are, however, no stocks in the country; and there is no reason why a lower price should be expected.

Prices current during the week are: Tar, 18s. 6d. to 24s. Pitch, nominal, 33s. 6d., west coast; 37s., east coast. Benzols, 90's, 2s. 3d.; 50's, 2s. Solvent naphtha, 1s. 4d. for shipment; 1s. 6d. for home consumption. Toluol, 1s. 10d. Crude 30 per cent. naphtha, 10d. Creosote, 1¼d.; Naphthalene, pressed, 45s.; drained, 27s. 6d. Cresylic acid, 1s.; crude, 10d. Carbolic acid, 60's, 1s. 9d.; 75's, 2s. Anthracene, "A," 1s.; "B," 9d. to 10½d. Prices quoted are usually subject to discount.

**Sulphate of Ammonia** shows no improvement. On the contrary, urgent sellers have accepted lower prices than were obtainable a week ago. It is galling to those who did not sell forward—naturally expecting better prices as the season advanced—to hear of deliveries being made on contracts at 20s. to 30s. above current values. Business has been done at £8 10s. to £8 12s. 6d. less 3½ per cent., f.o.b. at all shipping ports. For forward delivery, 5s. to 7s. 6d. more is offered. Gas liquor is quoted at 6s. to 7s. per ton.

This fact should be a little solatium to Dr. Brown, whose good-natured letter last week must excite sympathy. The fact is that spot value of sulphate does not regulate the price of ammonia liquor. The quotations given are either the record of important actual business done, or represent the prices at which such business is possible. Liquor sales are almost invariably made over a period; and when sulphate is unusually low, sulphate makers—Micawber-like, expecting something better to turn up—will always pay a better relative price for liquor for a forward contract. The price quoted is the value at the point of consumption. In case liquor has to be carried any distance, or when sulphate has to be shipped at considerable expense, and when acid, fuel, &c., are costly, of course quotations cannot possibly apply. One fact alone will convince Dr. Brown of the difficulty of making a price to apply all round. Notwithstanding the low price of sulphate, the Manchester Corporation have just declined to accept a tender for the liquor they

produce, which would have yielded considerably more than any recent quotation in the JOURNAL. Moreover, owing to much cheaper acid, as well as other necessaries to the manufacture of sulphate, manufacturers well situated can pay higher prices than formerly. A more important factor, and one Dr. Brown has probably not taken into his calculations, is the larger and ever-increasing quantities now being absorbed by manufacturers of ammonia for the ammonia-soda process, sal ammoniac, muriate of ammonia, galvanizing salts, white liquor ammonia for detergent purposes, which is a much larger business in Yorkshire and Lancashire than is commonly known, and last (but perhaps not least), beyond the ammonia contents, there are not a few buyers who purchase the liquor for the cyanides it contains—an industry which now is growing "by leaps and bounds." For these purposes, liquor is far more valuable than when sold for sulphate.

## COAL TRADE REPORTS.

### From Our Own Correspondents.

**Lancashire Coal Trade.**—Only a very slow sort of business continues to be reported generally throughout the coal trade of this district. The better qualities, suitable for house-fire purposes, do not meet with anything like the average demand for the season of the year; and many collieries have a difficulty in keeping on full time, while stocks remain altogether untouched. The lower descriptions of round coal remain a drug; and the excessively low figures which are quoted in the open market to effect clearances, and which render business of any moment only practicable at altogether unremunerative rates, are compelling colliery proprietors here and there to consider the advisability of closing some of their common coal pits. For house-fire coals, prices are about steady at 10s. to 10s. 6d. per ton for best Wigan Arley; 8s. 6d. to 9s., for Pemberton four-feet and seconds Arley; and 7s. to 7s. 6d., for the lower qualities. Common round coals, for steam and forge purposes, are weak and irregular, with if anything lower prices taken, especially for shipping orders. On inland sales of good ordinary steam and forge coals, it is exceptional where more than 6s. to 6s. 3d. per ton at the pit is being got; while for shipment, there are plenty of sellers at 5s. 3d. to 5s. 6d., which represents about 7s. to 7s. 3d. delivered at the Garston Docks or High Level, Liverpool. Only special qualities fetch above these figures. Engine fuel is moving off readily at many of the collieries; and others are putting into stock. The inferior descriptions are the most plentiful, and are quoted very low. At the pit mouth, common Lancashire slack scarcely averages more than 2s. 6d. to 3s. 6d. per ton; and better sorts, 4s. 6d. to 5s.

**Northern Coal Trade.**—There has been a little more animation in the steam coal trade; but several of the collieries of this class are still without sufficient orders to enable them to work full time. Best Northumbrian steam coals are still quoted at 8s. per ton f.o.b.; and steam smalls are 3s. 9d., with a fair demand. As the holiday time will lessen the production, and allow stocks to be reduced, it may be hoped that the fuller work of the last few days will continue at the steam-coal collieries. In gas coals, the largest consumption of the year is now being experienced; so that the pits are working very fully. There have been enormous despatches of coal; the quantity sent from Tyne Dock alone having averaged above 20,000 tons daily for a week or so. Prices of best Durham gas coals still range from 6s. 6d. to 7s. per ton f.o.b.; but most of the quantity that is being sent out is on contracts that range from 6s. to 6s. 9d. per ton f.o.b. There is little alteration in the demand for manufacturing coals; and most of the contracts for the supply for next year are renewed at prices that do not materially differ from those that have ruled for the supply of the present year. The coke trade is steady; there being a larger inland consumption, though the export demand is low, as usual at this time of the year. The prices quoted give an average of about 14s. 6d. per ton f.o.b. for best Durham coke. In the gas coke trade, there is no alteration in price; but the large production is still well taken up, and contracts for next year are being arranged for manufacturing purposes on much the same terms as the present ones. Some of the inland gas companies have, however, increased their stock of coke lately.

**Scotch Coal Trade.**—Trade shows no change; and it is not expected that there will be any further alteration until January is well in—the trade outlook being not particularly bright, on account of the strike in the shipbuilding industry. The prices quoted are: Main, 5s. 10d. per ton f.o.b. Glasgow; ell, 6s. 9d. to 7s.; splint, 6s. 9d.; and steam, 7s. 6d. to 7s. 9d. The shipments for the week amounted to 136,971 tons—a decrease as compared with the preceding week of 7204 tons, but an increase over the same week of last year of 1617 tons. For the year to date, the total shipments have amounted to 7,193,985 tons—an increase on the corresponding period of last year of 2,087,419 tons, but a decrease as compared with 1893 of 384,019 tons.

**Additional Borrowing Powers for the Maidstone Water Company.**—At a special meeting of the Maidstone Water Company on the 14th inst., the Directors asked for power to raise additional capital. It was also desired to consolidate the Company's stock at some future time. By the draft Provisional Order now before the Board of Trade, authority is sought to raise any further sum not exceeding £20,000 by the issue of new ordinary shares or stock. The Secretary (Mr. C. A. Case) said he did not anticipate any opposition to the Order; and the shareholders unanimously approved of its being proceeded with.

**The Proposed Purchase of the Shoreham Water-Works by the Brighton Corporation.**—Last Wednesday, the Water-Works Committee of the Brighton Corporation resolved that £150,000 should be substituted for £100,000 in the Bill promoted by them for the transfer of the Shoreham Water-Works, as the amount which the Corporation shall be authorized to borrow for the general purpose of water supply. Meanwhile, rumours of opposition to the scheme begin to be more pronounced; and, besides being privately discussed by the various local authorities concerned, the proposals of the Brighton Corporation are adversely criticized in public by gentlemen who possess undoubted knowledge of the question in all its bearings.

**Redruth Water-Works.**—The new works for supplying water to Redruth are approaching completion. The laying of the mains has been finished; and the reservoir is so far advanced that in all probability water will be turned into it in the course of a week or two. The reservoir is about 90 yards long and 60 yards wide, and has a depth of 33 feet.

**Great Combination in the Alkali Trade.**—It is authoritatively announced that negotiations which have been in progress for some six months past for a working arrangement between the three great Lancashire Alkali Companies—Messrs. Brunner, Mond, and Co., the United Alkali Company, and Messrs. Bowman, Thompson, and Co.—were completed last Friday.

**Mansfield Gas and Water Works Extensions.**—The Mansfield Town Council have accepted a tender (£1210) submitted by Messrs. Jonas Drake and Son, of Halifax, for a new retort-stack at the gas-works. It has been decided to make extensions of the water system to Pleasley and Tibshelf; and Mr. Amos Jenkins has been successful in obtaining the contract. His offer amounted to £5010.

**Leeds Corporation Water Supply.**—The City Engineer (Mr. T. Hewson) has reported to the Leeds Corporation Water Committee that the new 30-inch main from Swinsty to Arthington has been completed, with the result that there are now three gravitating mains between Swinsty and Eccup; and the total quantity of water which can be sent to Leeds without pumping at Arthington is above 18 million gallons per day—the daily consumption at the present time being 14¼ millions.

**The Management of the St. Ives (Cornwall) Gas-Works.**—The appointment of Gas Manager at St. Ives (Cornwall), vacant by the death of Mr. R. Johns, has been filled. At a meeting of the Town Council last Wednesday, the Gas Committee reported that three applications had been received for the post; and they recommended the appointment of a qualified gas engineer. The Council negatived the recommendation by eight votes to six, and selected Mr. Eldred Faull, a resident in the town, for the position. In the discussion, attention was called to the fact that the vacancy had not been advertised.

**New Contracts for the Whessoe Foundry Company, Limited.**—The large sulphate plant designed by Mr. A. Gillespie, of Glasgow, for Messrs. W. Baird and Co., of the Eglinton Iron-Works, Kilwinning, N.B., has been placed with the Whessoe Foundry Company, Limited. The whole of the recovery plant for Messrs. W. Baird and Sons and other large works in Scotland has been designed by Mr. Gillespie, and has, we understand, been most successful. The North-Eastern Railway Company have recently placed with the Whessoe Company an order for the steel tank, 74 ft. by 20 ft. 6 in., and the gasholder, 70 ft. by 20 ft., forming part of the extensions at one of their largest gas-works, the whole being designed and carried out by Mr. Head, their Chief Gas Engineer.

**The Scarborough Gas Company's Debenture Stock.**—At an extraordinary general meeting held last Wednesday, the Directors of the Scarborough Gas Company were authorized to issue from time to time debenture stock, for the purpose of clearing off the existing mortgages of the Company as these became payable, and of raising the whole of the moneys sanctioned by the Act of the past session. The Chairman (Mr. B. Fowler, J.P.) explained that the Directors thought they could get money on loan at less than 3½ per cent., the rate of interest now being paid on the mortgages. A resolution was also passed giving the Board power to raise £1998 in respect of a sum of £5994 of capital stock lately raised under the same Act. The Company have now about £38,000 of debenture stock.

**The General Gas Company of France.**—The report of this Company for the twelve months ending June 30 shows that the result of the working was a sum of 3,563,329 frs., the addition to which of the 168,928 frs. brought forward made a total of 3,732,257 frs. at the close of the financial year. Deducting the general expenses and the amount required to pay interest on the bonds, there was left a net balance of 2,630,601 frs. Further deducting the statutory reserve, the Directors' fees, and other charges, there remained a total of 1,333,501 frs., of which 300,000 frs. were distributed among the shareholders at the rate of 7 frs. 50 c. per share, and 850,000 frs. were added to the contingent fund; leaving 183,501 frs. to be carried forward. The dividend paid was 32 frs. 50 c. per share (500 frs.). The Company have ten stations in France, and nine in Belgium, as well as shares in various gas companies.

**Tunbridge Wells Water Supply.**—When the first borehole, rather more than 300 feet deep, was tested at Pembury, an average of 100,000 gallons a day for ten days was pumped up, and the depth of water was decreased about 25 feet. The Water Committee of the Tunbridge Wells Town Council then considered themselves justified in proceeding with another borehole; and they had one (passing through the same strata of about 70 feet of Wadhurst clay into the Ashdown sands) made; and two permanent pumps were erected, each being made to throw 10,000 gallons per hour, so that 480,000 gallons per day are being obtained, which is 80,000 gallons more than the actual requirements. After pumping 1,000,000 gallons, the water level was within 11 inches of where it was at the commencement of the tests; and the water, which was at first loaded with sand and clay, is now becoming clear and bright.

**Extensive Water-Works Improvements at Worcester.**—The Water Committee of the Worcester City Council have in contemplation the spending of some £30,000 in improving the supply. The works comprised in the scheme are: (1) A brick building for electric motors, pump wells, pumps, &c., and a bridge from the water-works to the island. Estimated cost, £1703. (2) A new engine-house and pumping plant, including two large steel boilers. Estimated cost, £7000. (3) A storage reservoir for 2 million gallons at Rainbow Hill. Estimated cost, £14,000. (4) Additional water-mains of larger size. Estimated cost, £6900. These particulars were presented to the City Council, in a report by the Water Committee, at their meeting on the 20th ult.; and, on a suggestion from the Committee, the report was referred back to them, in order that they might obtain the opinion of an expert as to the best method of having the work done.

**Launceston Water Supply.**—The completion of the Windmill service reservoir and the bringing of water into it has practically put the finishing touches to the new scheme of water supply for Launceston, of which a description recently appeared in the JOURNAL (*ante*, p. 988). A supply of very fine spring water has since gone into the reservoir from the intake at Bray Down. The quantity has proved to be very little in excess of the demand. But it is believed that considerable leakage is occurring in the town; and measures are to be taken to detect and diminish this. In any case, a larger supply from the same source is available in case of need.

**Penzance Water Supply.**—The necessity for taking action for the improvement of the water supply was urged at a meeting of the Penzance Town Council last Wednesday week. Mr. J. Trenwith, who brought forward the subject, said they had saved water by adopting Deacon's waste-meters; and they had obtained an additional supply from a well which was sunk. In spite of this, they had to turn off the water from September to October; and Penzance was certainly not in the position, as regards water supply, that a watering place should be in. New houses were being built; and with these additions they had not enough water to give a full supply all the year round. He had in his mind three or four schemes which he was assured could be carried out for very little money; and he moved that the question be referred to the Sanitary Committee, with a view to the construction of a new storage reservoir. Mr. W. H. Julyan, who seconded the motion, said the statement that the water was turned off from September to October should be qualified. It was only from Sept. 20 to Oct. 5. As to the cost, he did not think it could be done for a comparatively small sum. If they improved the supply in a satisfactory and complete way, they could not do it for much less than £10,000. Mr. H. Trembath suggested that the present reservoirs were leaking badly, and that water from the reservoir found its way into the well which had been made. By the expenditure of a few hundred pounds, the reservoirs could be so enlarged as to carry them over a good many years. The motion was agreed to.

**The Proposed Covering of Reservoirs at Southampton.**—Major-General Crozier has held an inquiry on behalf of the Local Government Board, respecting an application by the Southampton Corporation for sanction to borrow £6000 required for covering the two open reservoirs on the common. In his opening statement, the Town Clerk (Mr. G. B. Nalder) mentioned that the two reservoirs in question had a holding capacity of 6 million gallons. In 1889 the Water Engineer (Mr. W. Matthews) reported to the Council upon the serious contamination of the water in the uncovered reservoirs; and he made similar reports in March, 1892, and January, 1894. Between May of this year and the present time, it had been necessary to clean out the reservoirs five times; and the cost of cleaning was £12, while half a million gallons of water were lost. Another great disadvantage was that, when they cleaned the reservoirs, they were left with but one day's storage. Evidence was given in support of the application by Dr. Percy F. Frankland, who stated that the Otterbourne water, in its natural condition, was of almost unsurpassed organic purity, but somewhat inconveniently hard, which defect was, however, entirely remedied by the process of softening adopted. As underground water, it possessed the great advantage of an almost uniform temperature at all seasons of the year. In order to preserve the special virtues of such water—viz., freedom from organic matter and uniformity of temperature—it was necessary that it should be supplied either directly from the well or after a minimum period of storage, and that, during such storage as it received, it should be carefully protected from all sources of contamination and from the access of light. The proposed covering would be to the benefit and comfort of the inhabitants of Southampton. There had been some opposition in the Press and the Council to the proposed expenditure; but no antagonistic evidence was advanced at the inquiry.

## GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 1288.)

| Issue. | Share | When ex-Dividend. | Dividend or Div. & Bonus. | NAME. | Paid per Share | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|---|---|---|---|---|---|---|---|---|
| £ | | | p.c. | GAS COMPANIES. | | | | £ s. d. |
| 590,000 | 10 | 16 Oct. | 10½ | Alliance & Dublin 10 p. c. | 10 | 22½–23½ | .. | 4 9 5 |
| 100,000 | 10 | ,, | 7⅞ | Do. 7 p. c. | 10 | 16½–17⅞ | .. | 4 5 8 |
| 300,000 | 100 | 1 July | 5 | Australian (Sydney) 5 % Deb. | 100 | 107–109 | .. | 4 11 9 |
| 200,000 | 5 | 14 Nov. | 6½ | Bombay, Limited | 5 | 6⅞–7¼ | .. | 4 9 8 |
| 40,000 | 5 | ,, | 6½ | Do. New | 4 | 5–5⅛ | .. | 4 14 7 |
| 380,000 | Stck. | 14 Aug. | 12 | Brentford Consolidated | 100 | 268–273 | +1 | 4 7 11 |
| 180,000 | ,, | ,, | 9 | Do. New | 100 | 210–215 | +3 | 4 3 9 |
| 220,000 | Stck. | 27 Sept. | 11 | Brighton & Hove Original | 100 | 227–232 | .. | 4 14 10 |
| 933,500 | Stck. | 29 Aug. | 5 | Bristol | 100 | 124–128 | .. | 3 18 1 |
| 320,000 | 20 | 27 Sept. | 11½ | British | 20 | 54½–55½ | .. | 4 1 1 |
| 50,000 | 10 | 29 Aug. | 11½ | Bromley, Ordinary 10 p. c. | 10 | 22½–23½ | .. | 4 17 10 |
| 51,510 | 10 | ,, | 8½ | Do. 7 p. c. | 10 | 19–20 | +½ | 4 5 0 |
| 328,750 | 10 | 14 Nov. | 4 | Buenos Ayres (New) Limited | 10 | 7⅞–8¼ | .. | 4 17 1 |
| 200,000 | 100 | 1 July | 6 | Do. 6 p. c. Deb. | 100 | 102–104 | .. | 5 15 5 |
| 150,000 | 20 | 11 July | 8½ | Cagliari, Limited | 20 | 30–32 | .. | 5 3 3 |
| 550,000 | Stck. | 16 Oct. | 13½ | Commercial, Old Stock | 100 | 323–328 | +1 | 4 2 4 |
| 165,000 | ,, | ,, | 10½ | Do. New do. | 100 | 251–255 | +1 | 4 2 4 |
| 160,762 | ,, | 16 Dec. | 4½ | Do. 4½ p. c. Deb. do. | 100 | 147–152* | +6¾ | 2 19 2 |
| 800,000 | Stck. | 16 Dec. | 13 | Continental Union, Limited. | 100 | 268–273* | –1 | 4 15 3 |
| 200,000 | ,, | ,, | 10 | Do. 7 p. c. Pref. | 100 | 210–215* | .. | 4 13 0 |
| 535,000 | Stck. | 29 Aug. | 5¼ | Crystal Palace Ord. 5 p. c. Stk | 100 | 127–132 | .. | 3 19 6 |
| 486,090 | 10 | 26 July | 11 | European, Limited | 10 | 25½–26½ | .. | 4 3 0 |
| 354,060 | 10 | ,, | 11 | Do. Partly paid | 10 | 17–18 | .. | 4 14 3 |
| 5,646,590 | Stck. | 14 Aug. | 12⅞ | Gaslight & Coke, A, Ordinary | 100 | 295–300 | +2 | 4 5 0 |
| 100,000 | ,, | ,, | 4 | Do. B, 4 p. c. max. | 100 | 107–112 | .. | 3 11 5 |
| 665,000 | ,, | ,, | 10 | Do. C, D, & E, 10 p. c. Pf. | 100 | 287–292 | .. | 3 8 6 |
| 30,000 | ,, | ,, | 5 | Do. F, 5 p. c. Prf. | 100 | 135–140 | .. | 3 11 5 |
| 60,000 | ,, | ,, | 7⅛ | Do. G, 7⅛ p. c. do. | 100 | 200–205 | .. | 3 13 2 |
| 1,300,000 | ,, | ,, | 7 | Do. H, 7 p. c. max. | 100 | 193–198 | .. | 3 10 9 |
| 463,000 | ,, | ,, | 10 | Do. J, 10 p. c. Prf. | 100 | 287–292 | +5 | 3 8 6 |
| 476,000 | ,, | ,, | 6 | Do. K, 6 p. c. Prf. | 100 | 169–173 | +1 | 3 9 4 |
| 1,061,150 | ,, | 16 Dec. | 4 | Do. 4 p. c. Deb. Stk. | 100 | 135–140* | .. | 2 17 2 |
| 294,850 | ,, | ,, | 4½ | Do. 4½ p. c. do. | 100 | 145–150* | +½ | 3 0 0 |
| 908,000 | ,, | ,, | 6 | Do. 6 p. c. do. | 100 | 200–205* | +1 | 2 18 6 |
| 3,800,000 | Stck. | 14 Nov. | 12 | Imperial Continental | 100 | 233–238 | –2 | 5 0 10 |
| 75,000 | 5 | 16 Dec. | 6 | Malta & Mediterranean, Ltd. | 5 | 6–6⅛ | +¼ | 4 12 4 |
| 560,000 | 100 | 1 Oct. | 5 | Met. of Melbourne, 5 p.c. Deb. | 100 | 113–116 | .. | 4 6 2 |
| 541,920 | 20 | 14 Nov. | 5 | Monte Video, Limited | 20 | 16½–17½ | .. | 5 14 3 |
| 150,000 | 5 | 28 Nov. | 8 | Oriental, Limited | 5 | 7⅞–8¼ | .. | 4 16 11 |
| 60,000 | 5 | 12 Sept. | 7 | Ottoman, Limited | 5 | 5–5⅛ | .. | 6 7 3 |
| 166,870 | 10 | 14 Feb | 2 | Para, Limited | 10 | 1⅛–1⅜ | .. | 11 8 6 |
| 420,000 | 100 | 2 Nov. | 6 | People's Gas of Chicago—1st Mtg. Bds. | 100 | 105–110 | .. | 5 9 1 |
| 500,000 | 100 | 9 Dec. | 6 | 2nd Do. | 100 | 100–105 | .. | 5 14 3 |
| 150,000 | 10 | 16 Oct. | 7 | San Paulo, Limited | 10 | 11–12 | –½ | 5 16 8 |
| 500,000 | Stck. | 29 Aug. | 15½ | South Metropolitan, A Stock | 100 | 375–380 | .. | 4 1 7 |
| 1,350,000 | ,, | ,, | 12 | Do. B do. | 100 | 308–313 | .. | 3 16 8 |
| 308,685 | ,, | ,, | 13 | Do. C do. | 100 | 325–330 | .. | 3 18 9 |
| 800,000 | ,, | 11 July | 5 | Do. 5 p. c. Deb. Stk. | 100 | 175–178 | .. | 2 16 2 |
| 60,000 | Stck. | 12 Sept. | 11½ | Tottenham & Edm'nton, "A" | 100 | 250–255 | +20 | 4 10 2 |
| | | | | WATER COMPANIES. | | | | |
| 746,021 | Stck. | 26 June | 10½† | Chelsea, Ordinary | 100 | 297–302 | .. | 3 7 10 |
| 1,719,514 | Stck. | 16 Oct. | 7 | East London, Ordinary | 100 | 215–220 | .. | 3 3 7 |
| 654,740 | ,, | 26 June | 4½ | Do. 4½ p. c. Deb. Stk. | 100 | 157–162 | .. | 2 15 6 |
| 700,000 | 50 | 16 Dec. | 6½ | Grand Junction | 50 | 110–114* | .. | 2 17 0 |
| 708,000 | Stck. | 29 Aug. | 12† | Kent | 100 | 310–315 | .. | 3 16 2 |
| 1,043,800 | 100 | 26 June | 7½† | Lambeth, 10 p. c. max. | 100 | 247–252 | .. | 2 17 8 |
| 406,200 | 100 | ,, | 7½ | Do. 7½ p. c. max. | 100 | 210–215 | .. | 3 7 6 |
| 330,000 | Stck. | 27 Sept. | 4 | Do. 4 p. c. Deb. Stk. | 100 | 143–148 | .. | 2 14 2 |
| 500,000 | 100 | 14 Aug. | 12⅞ | New River, New Shares | 100 | 380–390 | .. | 3 3 7 |
| 1,000,000 | Stck. | 26 July | 4 | Do. 4 p. c. Deb. Stk. | 100 | 143–148 | .. | 2 14 2 |
| 902,300 | Stck. | 16 Dec. | 6 | S'thwk & V'xhall, 10 p.c. max. | 100 | 150–155* | +1 | 3 17 5 |
| 126,500 | 100 | ,, | 6 | Do. D 7½ p.c. do. | 100 | 139–142* | +1 | 4 4 6 |
| 1,155,066 | Stck. | 16 Dec. | 10 | West Middlesex | 100 | 288–293* | .. | 3 8 3 |

*Ex div.

† Next dividend will be at this rate.


# GWYNNE & BEALE'S
## PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 65,095.

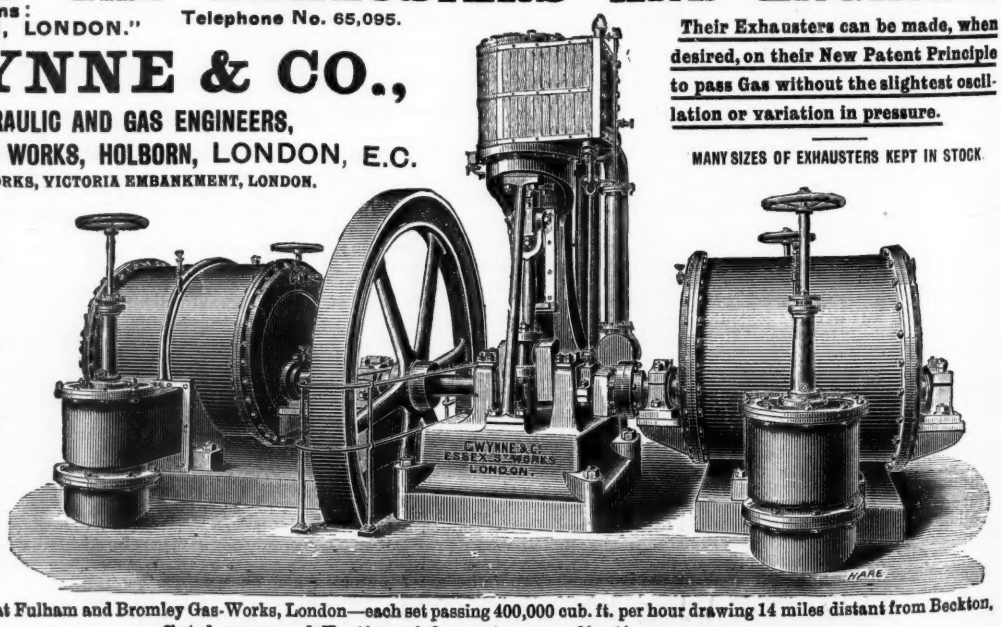
# GWYNNE & CO.,
## HYDRAULIC AND GAS ENGINEERS,
## BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

**They have completed Exhausters to the extent of 32,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.**

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

**Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.**




**Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.**

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.

Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton.

Catalogues and Testimonials sent on application.

**NOTICE TO ADVERTISERS.**—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.


GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

**O'NEILL'S Oxide has a larger annual** sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
JOHN WM. O'NEILL, Managing Director,
Palmerston Buildings, Old Broad Street, London, E.C.

ANDREW STEPHENSON, AGENT. All communications re Oxide to be addressed to Palmerston Buildings.

**WINKELMANN'S "VOLCANIC"** CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 300 British Gas-Works
ANDREW STEPHENSON,
182, GRESHAM HOUSE,
OLD BROAD STREET,
LONDON, E.C.
*Telegrams: "Volcanism, London."*

**AMMONIACAL LIQUOR Wanted.**
BROTHERTON AND CO., Ammonia Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

**GAS TAR Wanted.**
BROTHERTON AND CO., Tar Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

**SPENT OXIDE Wanted.**
BROTHERTON AND CO., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

**BROTHERTON & CO.**
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

**CARBIDE OF CALCIUM and Patent** Acetylene Gas Generator sold by READ HOLLIDAY AND SONS, Limited, HUDDERSFIELD.

**JOHN RILEY & SONS, Chemical Manu**facturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

SULPHATE OF AMMONIA SATURATORS.

**JOSEPH TAYLOR & CO., Chemical** Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c. CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special Attention to Repairs.
Before placing Orders, please write for Estimate.

BACK-PRESSURE IN PURIFIERS.

**THE Valve invented by Mr. Cripps for** Bye-Passing any Layer of Purifying Material (referred to by the President of the Incorporated Institution of Gas Engineers in his Inaugural Address) can be obtained of the Makers: C. & W. WALKER, Midland Iron-Works, Donnington, near Newport, SALOP, and J. EVERY & SON, Phœnix Iron-Works, LEWES, to which Firms all inquiries should be addressed.

METER MAKER AND REPAIRER.

**A STEADY Young Man (Age 21) wishes** Engagement, in a Gas-Works at Home or Abroad, as METER REPAIRER, or INSPECTOR. Repairs both Wet and Dry Meters, all Sizes; and fix and take state of same. Fair Fitter and Tinsmith. Six Years in Meter Trade.
Address No. 2608, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WELLINGTON (SALOP) COAL AND GASLIGHT COMPANY.

MANAGER AND ACCOUNTANT.

**THE Directors of the Wellington (Salop)** Coal and Gaslight Company invite APPLICATIONS for the appointment of MANAGER and ACCOUNTANT.
Particulars may be obtained from the undersigned.
Applications, endorsed "Gas Manager," with *copies* of three recent Testimonials, to be sent to me by Jan. 1, 1896.
(Signed) R. A. NEWILL,
Secretary.
Wellington, Salop,
Dec. 19, 1895.

**THE Corporation of Southport require** the services of an ASSISTANT GAS MANAGER.
Salary, £150 per Annum.
Applicants must have a practical knowledge of Gas Making, Modern Gas Plant, Chemistry, &c., and must be accustomed to the preparation of Plans and Drawings, and to the management of a large Staff of Workmen.
Applications, stating Age, previous Experience, and accompanied by *copies only* of recent Testimonials as to ability, and endorsed "Assistant Manager," must be forwarded to the undersigned not later than the 31st inst.
By order,
J. DAVIES WILLIAMS,
Town Clerk.

**W. C. HOLMES & CO., Huddersfield;** AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also Improved Patent Rotary Scrubber-Washers.
*** See Advertisement p. 1280 of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

**J. & J. BRADDOCK, Globe Meter Works,** Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock Oldham."

SULPHURIC ACID.

**JOHN NICHOLSON & SONS, Limited;** Chemical Works, Leeds, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

SPECIAL PAINT FOR GAS-WORKS.

**JOHN E. WILLIAMS AND CO.,**
VICTORIA PAINT WORKS,
MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1759

NEW GAS PLANT CEMENT.

**JOHN E. WILLIAMS AND CO.,**
VICTORIA PAINT WORKS,
MANCHESTER.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

SULPHATE OF AMMONIA SATURATORS.

**WALTER THOMASON and SONS,** Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.
Please write for Estimate before ordering elsewhere.

PATENTS FOR INVENTIONS.

**J. C. CHAPMAN, M.I.M.E. and Fel.** Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

**SADLER AND CO., LIMITED,** MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

**THE Undersigned is in a position to** supply, at the very lowest Prices, the most suitable kind of BENZOL for enriching Gas, made from Hardman's Patent Carbonization Process, of which I am the Sole Patentee. On application, I would furnish Price on the most reasonable terms; giving advice how to utilize it on the most economical method.
J. HARDMAN, Manufacturing Chemist.
Milton, Staffs.

**WANTED, at once, a Stoker for small** Gas-Works. Wages, 24s. to commence. One who can do a little Plumbing (which would be extra) will have a good job.
Address the MANAGER, Gas and Water Works, Beaumaris, ANGLESEY.

CORPORATION OF CALCUTTA.

WATER-WORKS DEPARTMENT.

**APPLICATIONS are invited for the post** of ASSISTANT ENGINEER to be in charge of the Water-Works Department. The Assistant Engineer must be an efficient Mechanical Engineer, thoroughly qualified in Steam, and must have had thorough practical experience of Pumping-Engines, and in the Superintendence of Water-Works Pumping-Stations, including the making of Filter-Beds, &c. He must also have full practical acquaintance with Distribution-Pipes and Adjuncts and Pumping Work.
The pay of the post is Rs. 500, rising, by annual increments of Rs. 25, to Rs. 700 per month. The above pay does not include Horse and House Allowances, which amount to Rs. 150 per month.
Officers of the Corporation are subject to Leave and Pension Rules passed under the provisions of the Calcutta Municipal Consolidation Act, 1888, copies of which Rules may be obtained in London from the undersigned.
The total quantity of Water, filtered and unfiltered, dealt with is 25,000,000 gallons per day; and there are seven Pumping-Stations, with an aggregate indicated horse power of 3400.
Written Applications only must reach the undersigned not later than the 28th of December, 1895, and should state Age and Experience of Applicants, and be accompanied by *copies* of Testimonials.
By order of the Corporation,
JOSEPH QUICK AND SON, C.E.
39, Victoria Street, Westminster.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

**BALE & CO.'S Oxide of uniform quality.** Sample and Price on application.
OXIDE PAINTS, OILS, SULPHURIC ACID, &c.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

OXIDE OF IRON.

**FINEST Quality of Natural Bog Ore.** Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

**PORTER & CO., Gowts Bridge Works,** LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for, Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER LINCOLN."

HYDRATED OXIDE OF IRON.

**PREPARED from pure Iron.**
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

**It is Worth Your While to Buy**
DIRECT.
THE RELIANCE LUBRICATING OIL COMPANY will SUPPLY on APPROVAL 40-gallon Barrels "RELIANCE" NON-CORROSIVE LUBRICANTS (which, through their superiority, have the largest sale in the world)—viz., Engine, Cylinder, and Machinery Oils, 11½d.; Spindle Oil, 8½d.; Gas-Engine and Dynamo Oils, 1s. 6d. per gallon; Barrels Free and Carriage Paid. Also Solid and Liquid Lubricants for all other purposes.
RELIANCE LUBRICATING OIL COMPANY,
19 & 21, WATER LANE, GREAT TOWER STREET,
LONDON, E.C.

**FLANGE-PIPES (Several hundred feet** of light second-hand Cast-Iron) wanted to Purchase, 36, 15, and 6 inches diameter.
Price and Particulars to No. 2609, care of Mr. King 11, Bolt Court, FLEET STREET, E.C.

**FOR SALE, Cheap—A Small GAS-**HOLDER, 40 feet diameter, by 12 feet deep. In good condition.
Apply to the MANAGER, Gas-Works, Sandown, I. OF W.

**FOR SALE—A Second-hand Wrought-**Iron WASHER-SCRUBBER, 30 ft. by 3 ft. 6 in., with 6-inch Valves and Connections. In working order.
Address the RUGELEY GAS COMPANY, LIMITED, Rugeley, STAFFS.

WIDNES CORPORATION GAS AND WATER WORKS.

GAS PLANT, &c., FOR SALE.

**THE Gas and Water Committee have** the following PLANT for disposal: ANNULAR CONDENSER, LIVESEY WASHER (each of a capacity of ¾ Million Cubic Feet per diem, and with 12-inch Connections), 12-inch STATION GOVERNOR, ENGINE and EXHAUSTER (capacity, 22,000 Cubic Feet per hour), MANN and WALKER TOWER SCRUBBER 38 ft. by 8 ft., and a WALKER PURIFYING-MACHINE of 1 Million Cubic Feet capacity per diem.
Further Particulars may be obtained on application to Mr. ISAAC CARR, Assoc.M.Inst.C.E., Gas-Works, WIDNES.

**FOR SALE—All the Gas Plant at East** Bridge Street, Falkirk, comprising—
HYDRAULIC MAIN, 50 ft. by 14 in. by 14 in. ⊃ shape, in Six Sections.
Twenty ∩ MOUTHPIECES, 24 in. by 14 in., with Doors and Screws, 6-inch ASCENSION-PIPES and BRIDGE PIPES.
One set of Annular CONDENSERS, 6-inch Connections.
Four PURIFIERS, 12 ft. by 8 ft. by 4 ft. 6 in., with Hydraulic Valves and Lifting-Crane. CORRUGATED IRON ROOF over Purifiers, with Six Cast-Iron Columns.
One STATION METER, by Milne, 4-inch Connections.
Three GASHOLDERS—One 40,000 Cubic Feet, in Cast-Iron Tank, with Six Columns and Counterbalance Weights; one 14,000 Cubic Feet, with Four Columns; and one Telescope Holder, 9000 Cubic Feet, Four Columns and Counterbalance Weights.
The Plant may be inspected on application to the Manager, P. B. Watson.
Offers will be received for the whole or any part of the Plant, as offerers see fit.
The Commissioners do not bind themselves to accept the highest or any offer.
Offers to be lodged with
JAMES WILSON,
Town Clerk.
Burgh Buildings, Falkirk
Dec. 13, 1895.

**FOR SALE**—The Oxygen Plant recently erected for Purification Purposes at the Stoke-on-Trent Corporation Gas-Works, by Brin's Oxygen Company, Limited.

It may be inspected on application to the Manager, Mr. W. Prince.

No reasonable offer will be refused.

---

TO IRONFOUNDERS.

**THE Urban District Council of Buxton** invite TENDERS for the supply of 1000 yards of 3-inch Turned and Bored GAS-PIPES.

Particulars to be obtained of Mr. Geo. Smedley, Town Hall, Buxton.

Tenders, endorsed "Tender for Gas-Pipes," to be sent in not later than the 4th of January, addressed to the Chairman of the Gas Committee.

By order,
JOSIAH TAYLOR,
Clerk.

Town Hall, Buxton,
Dec. 19, 1895.

---

SHEFFIELD UNITED GASLIGHT COMPANY.

NEEPSEND STATION.

No. 2 RETORT-HOUSE.

TO STEEL PIPE MANUFACTURERS.

**THE Directors of this Company invite** TENDERS for the Manufacture and Delivery (without erection) of a circular STEEL FOUL-GAS MAIN, consisting of about 670 feet 30 inches diameter, 170 feet 24 inches diameter, and 160 feet 18 inches diameter, with all necessary Bends, Tees, and Specials.

Copies of the Drawings, with Specification and Form of Tender, may be obtained upon application to the Engineer, Mr. Fletcher W. Stevenson, upon payment of 10s. 6d. (not returnable).

Sealed tenders, endorsed "Tender for Foul-Gas Main," to be delivered by post to the undersigned, at the Company's Offices, on or before Saturday, Jan. 4, 1896.

The Directors do not bind themselves to accept the lowest or any tender.

HANBURY THOMAS,
General Manager.

Commercial Street, Sheffield,
Dec. 12, 1895.

---

SOUTH METROPOLITAN GAS COMPANY.

SALE BY TENDER OF £20,000 FIVE PER CENT. PERPETUAL DEBENTURE STOCK.

MINIMUM PRICE, £172½ per cent.

**NOTICE is Hereby Given,** that it is the intention of the Directors of this Company to SELL BY TENDER £20,000 of Five per Cent. PERPETUAL DEBENTURE STOCK, in accordance with the Provisions of the South Metropolitan Gas Act, 1882.

Particulars of same, with Form of Tender, can be obtained at this Office on application to the undersigned; and tenders must be sent in on or before Wednesday, the 1st day of January, 1896.

The Stock will be allotted to the highest bidders; but no tender will be accepted at a lower price than at the rate of £172½ money for each £100 Debenture Stock.

By order,
FRANK BUSH,
Secretary.

Offices: 709A, Old Kent Road, S.E.,
Dec. 7, 1895.

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RESULT OF SALE OF GAS SHARES AND DEBENTURES.

**MESSRS. FULLER, HORSEY, SONS,** AND CASSELL beg to announce that of the Lots that were withdrawn at this Sale on account of the Biddings not having reached the Reserve Prices, such as have not been since Sold Privately are now for SALE by TREATY, with or without accrued Dividends.

11, BILLITER SQUARE, E.C.

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## NOTICE.

Whereas it has come to the knowledge of the INCANDESCENT GAS LIGHT COMPANY, Limited, of Palmer Street, Westminster, that a Company called the "Meteor" Incandescent Lighting Company, Limited, is selling and offering for sale a form of Incandescent Gas Light known as the "Meteor" Incandescent Gas Light.

This is to Give Notice that the Incandescent Gas Light Company, Limited, will commence actions for infringement of their Patents against all persons found dealing in any manner with the said "Meteor" Incandescent Gas Light which is constructed in infringement of the Patents of the Incandescent Gas Light Company, Limited. The validity of these Patents has been established, and a certificate to that effect has been granted, by the Hon. Mr. Justice Romer.

FAITHFULL & OWEN,
11, Victoria Street, S.W.
Solicitors to the Incandescent Gas Light Company.

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## NOTICE.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED, Hereby Give Notice, that a Firm of F. J. Putz & Co., 16 and 17, Great St. Helen's, London, are advertising for sale Incandescent Gas-Light Apparatus called the "Champion" Incandescent Gas-Burner, and are stating in their circular that such Apparatus may be legally sold throughout the United Kingdom without Infringement of any existing Patent.

This is to Give Notice to the Public and the Trade that Actions for Infringement of Patent and for an Injunction will be immediately commenced by the Incandescent Gas-Light Company, Limited, against any persons using or selling such Apparatus.

The validity of the Company's Patents has already been certified by Mr. Justice Romer; and Solicitor and Client costs will be enforced in all cases.

FAITHFULL & OWEN,
11, Victoria Street, S.W.
Solicitors for the Incandescent Gas-Light Company, Limited.

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## NOTICE.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED, Hereby Give Notice, that they only supply their Mantles subject to the following express Conditions, which are printed and pasted on each box:—

> "The Incandescent Gas-Light Company, Limited, in supplying the Mantle contained in this box, grant a Limited License to the purchaser to sell or use the same on the express condition that neither the purchaser nor any other person into whose hands the same may come shall use or sell the said Mantle except in connection, or for use, with Burners sold or supplied by the Company; any other sale or use will amount to Infringement of the Company's Patents. The Company supply Mantles for the purpose of renewals at the nominal price of 1s. 3d., subject to the Conditions and Limitations above set forth."

In the case of *The Incandescent Gas-Light Company, Limited v. Cantelo*, Mr. Justice Wills upheld the Validity of these Conditions and Limited License; and, in the course of his Judgment, said:—

> "The patentee has the sole right of using and selling the articles; and he may prevent anybody from dealing with them at all. Inasmuch as he has the right to prevent people from using them or dealing in them at all, he has the right to do the lesser thing—that is to say, to impose his own conditions. It does not matter how unreasonable or how absurd the conditions are. It does not matter what they are if he says at the time when the purchaser proposes to buy, or the person proposes to take a license: 'Mind I only give you this license on this condition;' and the purchaser is free to leave it or take it as he likes. If he takes it, he must be bound by the condition."

In the case of *The Incandescent Gas-Light Company v. Hirschfeld and Others*, the Honourable Mr. Justice Romer certified that the Validity of the Plaintiffs' Patents was established. Infringers in future will be liable to costs as between Solicitor and Client.

(Signed) FAITHFULL & OWEN,
Solicitors for the Incandescent Gas-Light Company, Limited.

---

*Price 15s., Limp Cloth, the Fifteenth Yearly*

## ANALYSIS OF THE ACCOUNTS

OF THE

## Metropolitan Water Companies,

Compiled and arranged by

**ALFRED LASS, F.C.A.**

WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

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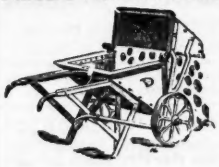
**PRICE'S PATENT COKE & COAL BARROW**



effecting a great saving of time, labour, and expense.

For Particulars, Price, &c., apply to Mr. E. PRICE, Inventor and Patentee, 119, Queen's Road, FINSBURY PARK, N.

*Prices are Reduced.*

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## HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

**For prices, f.o.b. Ship or Delivered by Rail, apply to**

**THE WALLSEND & HEBBURN COAL COMPANY, LTD.,**
8 Lombard Street,
NEWCASTLE-ON-TYNE.
**W. RICHARDSON, Fitter.**

---

## *DAUER – Gasglühlicht*

| QUALITY | A. | B. | C. |
|---|---|---|---|
| Prime Incandescent Bodies . . | 1s. | 11d. | 7d. |
| Incandescent Light Burners, with hardened head . . . . | 9d. each. | | |

Good Articles, always of uniform make, warranted.

**HIRSCH, JANKE, & CO.,**
*Centrale für Beleuchtungswesen,*
**BERLIN S.O. Rungestr. 18a.**

---

BROWNING & ANDERSON'S
Patent
Double-Acting, Non-Freezing,

## DEEP LIFT, AND FORCE PUMP.

These Pumps are completely different in construction and principle from all others. They are capable of raising water from 5 feet to 500 feet. It is impossible to draw Air; there being no suction. They have no suckers of any kind, no stuffing-box, no rod working inside the conducting-pipe, but are **double-acting, submerged Pumps,** worked with half the labour and time.

**Will Pump Tar, &c., and strongly recommended for Gas-Works.**

SILVER MEDALS from the principal Agricultural Societies. GOLD MEDAL, Industrial and Colonial Exhibition, Manchester, &c.

**For Particulars and Price List, apply to**

**R. A. BROWNING, Assoc.M.Inst.C.E.,**
**Gas-Works, Neath.**

---

## UNEQUALLED.

Gas Companies are solicited to try Samples of the

## MIRFIELD
## BLACK BED GAS COAL.

*Prices and Analysis on application.*

**MIRFIELD (GAS-COAL) COLLIERY COMPY.**
**RAVENSTHORPE, NEAR DEWSBURY.**

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**HUNTER'S**

## OXIDE OF IRON.

JAMES HUNTER, MINER, AND SHIPPER OF NATURAL IRISH BOG ORE.

This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed.

**Samples and Prices on application.**

**5, PRINCES STREET, PORT GLASGOW.**
Telegrams: "HUNTER, PORT GLASGOW."
**Established 1872.**

## TROTTER, HAINES, & CORBETT,

**Brettell's Estate**

## FIRE-CLAY & BRICK WORKS, STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: R. CULL, 31, OLD BROAD ST., E.C.

## LONDONDERRY GAS COALS

FROM THE

## MARQUIS OF LONDONDERRY'S COLLIERIES,

**COUNTY OF DURHAM.**

Available output up to 5000 tons per day
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

## S. J. DITCHFIELD,

**SEAHAM HARBOUR, COUNTY OF DURHAM.**

## JAMES OAKES & Co.,

**ALFRETON IRON-WORKS, DERBYSHIRE,**

AND

**Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,**

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

## HOLMSIDE GAS COALS.

PRESENT DAILY PRODUCE OVER 4000 TONS.

LATEST ANALYSIS:—

Yield of Gas Per Ton. . 11,205 Cubic Feet.
Illuminating Power, 16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality) 13⅜ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash. . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

## SOUTH MOOR PELTON GAS COALS.

PRESENT DAILY PRODUCE AVAILABLE 2500 TONS.

RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton. . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . 13½ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash. . . . . 1·34 Per Cent.
Tar. . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 94½ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COAL-FIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

## MR. MARK ARCHER,

**HOLMSIDE AND SOUTH MOOR OFFICES, NEWCASTLE-UPON-TYNE.**

## TO ENGINEERS & MANAGERS.

ESTABLISHED OVER 50 YEARS.

This is to certify that I, SAMUEL NELSON, am the only ORIGINAL MAKER of the SOLID LEAD SATURATOR, or the CASED SATURATOR.

All Estimates given free for Lead Chemical Burning, and also Contracts for Sulphate Saturators.

**Note Address—**

**20, SPRING GARDENS, BOLTON, Lancashire.**

*Please write for Estimate before ordering elsewhere.*

## THE SILICA FIRE-BRICK COMPANY,

**OUGHTIBRIDGE, near SHEFFIELD,**

MANUFACTURE

## SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

**FOR GAS-FURNACES.**

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY,

Strongly recommended where EXCESSIVE HEATS have to be maintained.

## THORNLEY GAS COALS

WORKED BY THE

## WEARDALE IRON & COAL Co., Ld.

OUT OF THEIR

**THORNLEY AND WHEATLEY HILL COLLIERIES.**

**Analysis made by**

**Messrs. J. & H. S. PATTINSON,** *May 28, 1895.*

| | |
|---|---|
| Yield of Gas per Ton . . | 10,500 Cub. Ft. |
| Illuminating Power . . | 16·9 Candles. |
| Coke (of good quality) . . | 67·5 per Cent. |
| Sulphur . . . . . | 0·58 ,, |
| Ash . . . . . | 2·73 ,, |

**For Price, &c., apply to the**

## WEARDALE IRON & COAL Co., Ld.

**QUAYSIDE, NEWCASTLE-ON-TYNE.**

**Following the acquisition of new Works situated in the heart of the cheapest Coal, Iron, and Steel Districts, we have added to our Technical Staff the MOST SUCCESSFUL MODERN EXPERTS in the designing of**

## AUTOMATIC COAL & COKE HANDLING PLANTS

WE EARNESTLY WISH ENGINEERS TO INSPECT OUR LATEST DESIGNS.

## New CONVEYOR Co., Ld.,

**3 & 4, Lime Street Square, London, E.C.**

## NEWBATTLE CANNEL.

**Highest Results in Gas, & Excellent Coke.**

QUOTATIONS ON APPLICATION TO

## THE LOTHIAN COAL COMPANY,

LIMITED,

**NEWBATTLE COLLIERIES,**

**DALKEITH, N.B.**

## THOMAS TURTON AND SONS, LIMITED,

**SHEAF WORKS, SHEFFIELD,**

*MANUFACTURERS OF*

## FILES OF BEST QUALITY

FOR ENGINEERS.

## STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.

LONDON OFFICE:

**90, CANNON STREET, E.C.**

## KENT'S THICK GAS COAL

RAISED AT

## The Wharncliffe Woodmoor Colliery,

**BARNSLEY.**

*Yield of Gas, nearly* 12,000 *Cubic Feet per ton of Coal; and Illuminating Power nearly* 17½ *Candles.*

*The following is a complete ANALYSIS made by Mr. R. O. PATERSON, C.E., Gas-Works, Cheltenham:—*

| | |
|---|---|
| Specific Gravity (Water 1). . | 1·276 |
| Weight of One Cubic Foot. . | 79·700 lbs. |

**PROXIMATE ANALYSIS.**

| | |
|---|---|
| Moisture in Coal . . . . . | 2·68 per cent. |
| Volatile Matter. . . . . | 35·60 ,, |
| Fixed Carbon . . . . . | 58·80 ,, |
| Sulphur . . . . . | 0·96 ,, |
| Ash. . . . . | 1·96 ,, |

**COMMERCIAL ANALYSIS.**

| | |
|---|---|
| Gas per Ton of Coal . . . . | 11,760 cub. feet. |
| Gas per Cubic Foot of Coal . | 418 ,, |
| Illuminating Power . . . . | 17·44 candles. |
| Value of One Cubic Foot in Sperm . . . . . | 418 grains. |
| Value per Ton of Coal in Sperm . . . . . | 703 lbs. |
| Coke per Ton of Coal . . . | 1367 ,, |
| Coke . . . . . | 61·05 per cent. |
| Ash in Coke . . . . . | 3·21 ,, |
| Sulphur Eliminated with Volatile Products per Ton of Coal | 9·4 lbs. |
| Sulphur in Coke per Ton of Coal . . . . . | 12 ,, |
| Ammoniacal Liquor per Ton of Coal . . . . . | 19·7 galls. |
| Tar per Ton of Coal . . . . | 12·2 ,, |

R. O. PATERSON, C.E.

*Gas-Works, Cheltenham, 8th August,* 1894.

**For Price, &c., apply to the**

## Wharncliffe Woodmoor Colliery Co LIMITED,

**BARNSLEY;**

*Or to* **Mr. W. H. HARVEY,**

**17, Old Queen Street, Westminster, S.W.**

# ALL TELESCOPE HOLDERS SHOULD BE FITTED

WITH

# CUTLER'S PATENT FREEZING PREVENTER

WHICH HAS BEEN FITTED TO MANY OF THE LARGEST GASHOLDERS IN LONDON AND THE PROVINCES, AND IN AUSTRIA, GERMANY, DENMARK, AND THE UNITED STATES.

**Full Particulars and Prices from S. CUTLER & SONS, MILLWALL, LONDON.**

## BOLDON GAS COALS.

**Worked by THE HARTON COAL CO., LTD.**

**Output about 8000 tons per day.**

ANALYSIS—

| | | |
|---|---|---|
| Yield of Gas per ton | 10,500 | Cubic Feet. |
| Illuminating Power | 16·9 | Candles. |
| Coke | 66·7 | Coke. |
| Sulphur | 0·86 | Sulphur. |
| Ash | 2·04 | Ash. |

**Boldon Gas Coals are supplied under contract to**

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Danish Gas Company, Bombay Gas Company, San Paulo Gas Company, Alliance and Dublin Consumers' Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

**For prices, &c., apply to the**

**HARTON COAL COMPANY,**
LIMITED,
**Newcastle-on-Tyne.**
W. H. PARKINSON,
FITTER.

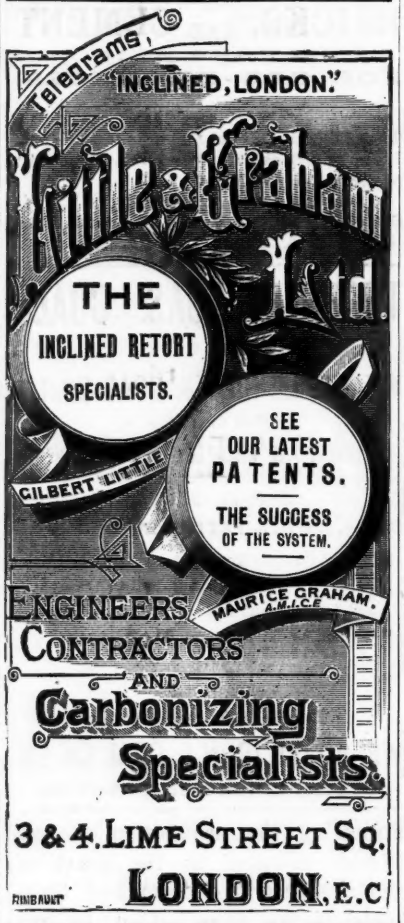
## THE DRUM

**FOR PUMPING AIR, WATER, SEMI-FLUIDS, &c.**
See Advertisement in last and next issue.

## ROBERT MARSHALL,

**CANNEL COAL MERCHANT,**
97, WELLINGTON STREET, GLASGOW.

*Prices and Analysis of all the Scotch Cannels on Application.*



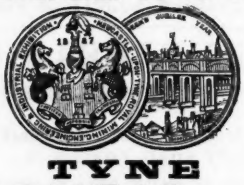

## "BEAR CREEK" CANNEL.

**LOG MOUNTAIN COAL, COKE, AND TIMBER CO.**
PINEVILLE, KENTUCKY, U.S.A.
Cable Address: "Hull, Pineville."

LONDON AGENTS:
**W. J. WILSON & CO., Suffolk House, Cannon St., E.C.**

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

## CANNEL & COAL.



## TYNE BOGHEAD CANNEL.

| | |
|---|---|
| Yield of Gas per ton | 13,155 cub. ft. |
| Illuminating Power | 38·22 candles. |
| Coke per ton | 1,301·88 lbs. |

## EAST PONTOP GAS COAL.

| | |
|---|---|
| Yield of Gas per ton | 10,500 cub. ft. |
| Illuminating Power | 16·3 candles. |
| Coke | 70 per cent. |

## SOUTH PELAW MAIN GAS COAL.

| | |
|---|---|
| Yield of Gas per ton | 10,500 cub. ft. |
| Illuminating Power | 16·3 candles. |
| Coke | 73·1 per cent. |

*For Prices and complete Analysis, apply to*

**THOS. W. DANCE & SONS,**
COAL OWNERS, NEWCASTLE-ON-TYNE
OR
**E. FOSTER & CO.,**
21, JOHN STREET, ADELPHI, LONDON, W.C.

# HUTCHINSON BROTHERS,

**GAS ENGINEERS, &c.,**

MANUFACTURERS OF

## Improved Wet & Dry Gas-Meters.

**STATION-METERS. LAMP-METERS.**

*Test Gasholders and General Gas Apparatus.*

**Brass Main & Lamp Taps. Unions, Ferrules, &c.**

**The "Falcon" Lamplighter's Torch. Service Cleansers.**

SYPHON AND OTHER PUMPS.

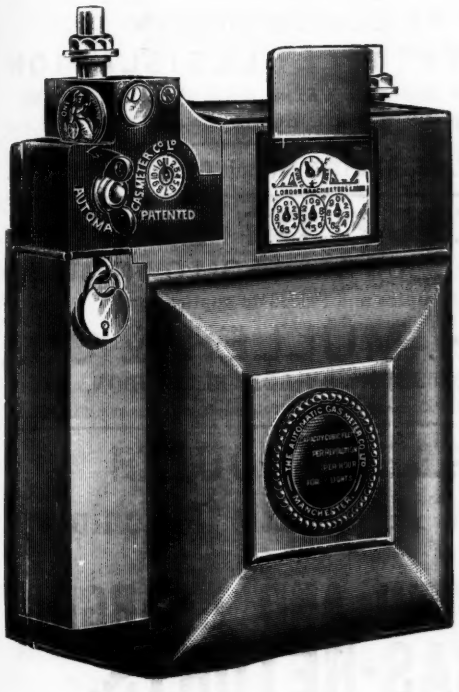
**WOOD AND WROUGHT-IRON PURIFIER-GRIDS. SCRUBBER BOARDS.**

WET AND DRY METERS REPAIRED.

**FALCON WORKS, BARNSLEY.**

*Telegrams: "HUTCHINSON BROS., BARNSLEY."*

# THE AUTOMATIC GAS-METER (1895) CORPORATION LIMITED.




**Our Attachment is the Most Simple in the Market.**

**STRONG, ACCURATE, & RELIABLE.**

**Notice.**

We hold what we believe to be the

**MASTER PATENT**

for all practical Automatic Gas-Meters.

Our Meters are manufactured under careful supervision, and Materials only of the Best Description are used. Every part of the mechanism is interchangeable; and the whole of the Attachment can be inspected or taken out readily by simply unscrewing the front of box off. Coins in box and Meter Dials must agree together.

## The Automatic Gas-Meter (1895) Corporation, Ltd.

**Offices and Works:**

49, QUEEN VICTORIA STREET, LONDON, E.C.

UPPER BROOK ST., and 41, CORPORATION ST., MANCHESTER.

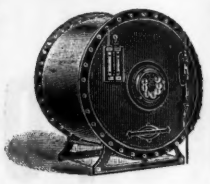
5, MERRION STREET, LEEDS.

# JAMES MILNE & SON, LTD.,

GAS ENGINEERS,

MILTON HOUSE WORKS, EDINBURGH.

LONDON. — GLASGOW. — LEEDS.



# SUPER CANNELINE

FOR ENRICHING COAL GAS

Is practically (during Twelve Months' trial at Works near London) giving results equal to Benzol, and costing less than half the Price.

**S. BOWLEY & SON, Manufacturers, Wellington Works, Battersea Bridge, LONDON.**

Gas-Bags for Mains. High Water-Boots. Woollen Miners' Jackets.

Delivery and Suction Hose, Gutta-Percha Acid Bottles, Leather Driving Bands, Woven Canvas Hose for Fire-Engines, Wedge and Square Gas-Bags, Air and Water Beds for Invalids, Oil Tarpauling Coats, Trousers, Hats, &c., Squeegees for cleansing Pavements, &c., Billiard and Bagatelle Cush, Tricycle Tyres, Leather Hose, Cotton Waste, Engine Cloths, Oils, &c., India-rubber Waterproof Garments for Walking, Driving, or Sporting Wear, Diving and Wading Dresses, Printers' Blankets, Iron Wheels and Rollers covered with India-rubber. Stokers' Gloves, 14s. 6d. per dozen.

*Write for Price List to*

**THOMAS BUGDEN, Manufacturer,**

71, GOSWELL ROAD, LONDON, E.C.

# GOLD BRAND CHIMNEYS,

Proved the best Chimneys in the Market

FOR INCANDESCENT GAS-LIGHT.

According to Trials in Street Lighting,

40 per cent. better than the Jena Schott Chimneys.

**PRICE 37s. 6d. Per Hundred.**

Special Terms for Large Contracts.

Sample dozens at 6s. sent post free.

**GEORGE HOPP,**

*Sole Agent for the U.K.,*

*17, SOUTH CASTLE STREET, LIVERPOOL.*

District Agent Wanted in all places of the U.K.

*Price 21s., Post Free,*

PRECEDENTS IN

PRIVATE BILL LEGISLATION

AFFECTING GAS AND WATER UNDERTAKINGS, 1879-90.

Compiled by E. H. STEVENSON & E. K. BURSTAL.

**London: WALTER KING, 11, Bolt Court, Fleet St., E.C.**

# OXIDE OF IRON.

NATURAL BOG ORE FROM OWN MINES.

Samples and Prices on application.

**WM. H. MÜLLER & CO.,**

81, PALMERSTON BUILDINGS, LONDON, E.C.

TRADE MARK: "Compascum." Telegraphic Address: "FERRUM."

# ARROL-FOULIS

**Patent Automatic Machinery**

FOR

# DRAWING AND CHARGING GAS-RETORTS.

**Full Particulars may be obtained from the Sole Makers,**

**SIR WILLIAM ARROL & CO., Limited,**

**GLASGOW.**

[See Illustrated Advertisement, Dec. 3, p. 1165.]

# HANNA, DONALD, & WILSON,

*(Established 1851),*

**GAS ENGINEERS & CONTRACTORS,**

Abercorn Foundry and Abbey Works,

**PAISLEY, N.B.,**

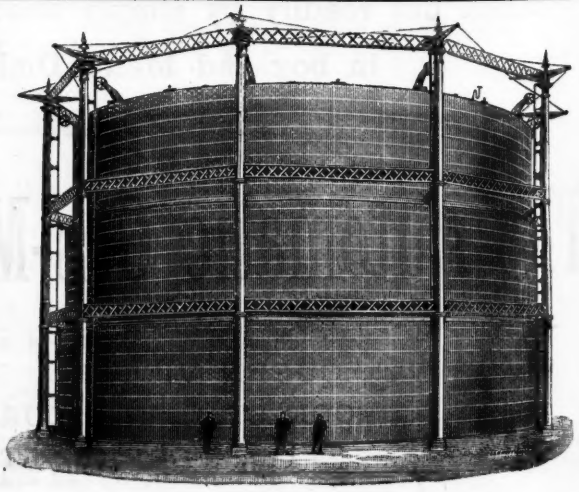
MAKERS OF

# Gasholders and Gas Plant

**OF EVERY DESCRIPTION.**

Sole Agents for Scotland for the Automatic Coal-Gas Retort (Inclined System) Company, Limited.

**Telegraphic Address: "Donald, Paisley."**



# WILLEY & CO.,

**GAS ENGINEERING CONTRACTORS,**

**EXETER,**

For **GASHOLDERS** and all kinds of **ENGINEERING APPARATUS.**

For **WET** and **DRY GAS CONSUMERS' METERS.**

For **COIN METERS,** their Patent Automatic is admitted to be one of the best and most reliable in the Market. Largely used in the Metropolis.

For **GAS-FITTINGS,** Registered Designs in Extensive Variety.

Manufacturers of the **LIVESEY WASHER.**

Agents for the **MAXIM CARBURETTOR.**

**New Works, 5 acres in extent, recently opened in the City of Exeter for the Manufacture of every kind of Apparatus used in the Production, Distribution, and Sale of Gas.**

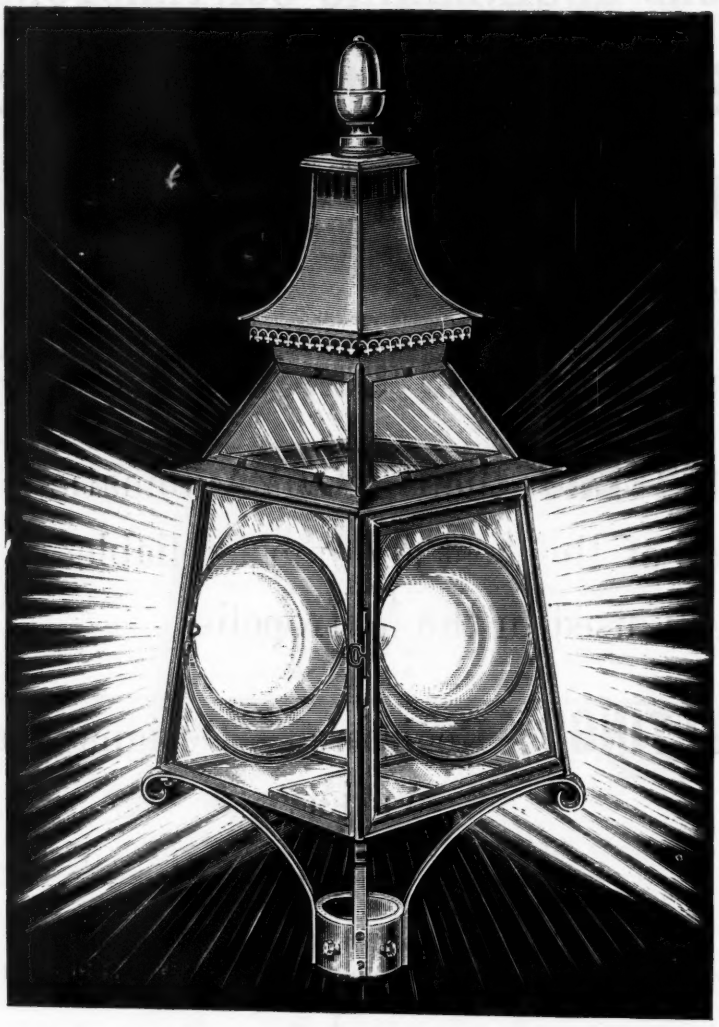
**Telephone 132.** **Telegraphic Address: "Willey, Exeter."**

**ESTABLISHED 30 YEARS.**

# "LOFTUS"

# PATENT STREET-LANTERNS

**100**
PER CENT.
**MORE LIGHT**
CAN
BE OBTAINED
FROM
ANY FLAME
BY
USING
THIS
LANTERN
INSTEAD OF
THOSE
NOW USED.



PUBLIC BODIES,
CORPORATIONS,
AND
GAS COMPANIES
CAN SAVE
50 PER CENT.
BY USING
THIS
LANTERN
FOR
STREET
LIGHTING.

Can be fitted for
OIL
where required.

No. 420 G.

FIRST COST LITTLE MORE THAN ORDINARY LANTERNS.

**Exceedingly Brilliant Light in direction of Lenses,**
**Lights Footway all along between Lamps.**

For Further Particulars, inquire for PRICE LIST "L" from

# THE SUNLIGHT & SAFETY LAMP CO., LTD.

## ROSCAR WORKS, BIRMINGHAM.

Telegraphic Address: "PROGRESS, BIRMINGHAM." A.B.C. Code used.

Or from London Agent: J. JONAS, 38, Lime Street, E.C.,
where a Specimen Lamp can be seen.

ALEX. C. HUMPHREYS, M.Inst.C.E. A. G. GLASGOW, M.E.

# MESSRS. HUMPHREYS & GLASGOW

Have constructed their EUROPEAN type of

## CARBURETTED WATER-GAS PLANT

At the following Gas-Works:—

| | | | |
|---|---|---|---|
| Copenhagen | 700,000 Cub. Ft. | Brussels | 700,000 Cub. Ft. |
| Belfast | 1,700,000 ,, | Liverpool | 2,500,000 ,, |
| Glasgow | 300,000 ,, | Tottenham | 600,000 ,, |
| Santiago | 400,000 ,, | Brighton | 1,250,000 ,, |
| Swansea | 700,000 ,, | Bath | 1,000,000 ,, |

And have now under Contract:—

| | | | |
|---|---|---|---|
| Belfast (Second Contract) | 3,500,000 Cub. Ft. | Manchester | 3,000,000 Cub. Ft. |
| Preston | 1,500,000 ,, | New York | 1,000,000 ,, |
| Southport | 750,000 ,, | Newburgh, N.Y. | 350,000 ,, |
| Tottenham (Second Contract) | 750,000 ,, | St. Joseph, Mo. | 750,000 ,, |

In addition to which the previous Installations of The Gaslight and Coke Company under this System have a total capacity of 10,000,000 cubic feet per diem.

*9, Victoria Street, London, S.W.* Telegrams: "EPISTOLARY, LONDON." *United States Office, 64, Broadway, New York.*

## JOHN BROWN & CO., LTD., SHEFFIELD,

Proprietors of

ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

## ALDWARKE MAIN GAS COAL

Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
*Telegrams: "ATLAS SHEFFIELD."*

TANKS ROOFS

CUTLERS PATENT TUBULAR GAS CONDENSER SUITABLE FOR GASWORKS OF ALL SIZES, AND FOR ANY CLIMATE OVER 100 ERECTED

MAKERS OF GASHOLDERS OF EVERY SIZE AND TYPE

HUNT'S PATENT WASHER. IS THE ONLY APPARATUS NECESSARY BETWEEN THE CONDENSER & PURIFIERS. IT REQUIRES NO MOTIVE POWER

TELEGRAMS "RETORTUS" LONDON

NATIONAL TELEPHONE 5059.

## S. CUTLER & SONS, MILLWALL LONDON

FOREIGN AGENTS COLONIAL AGENTS

A SPECIALTY STEEL TANKS FOR GASHOLDERS AND OIL STORAGE.

IMPROVED SYSTEM OF CARBURETTED WATER-GAS PLANT PARTICULARS ON APPLICATION.

CUTLER'S FREEZING PREVENTER IS THE BEST APPLIANCE FOR PREVENTING FORMATION OF ICE IN GASHOLDER CUPS. IT IS IN USE AT MANY IMPORTANT WORKS IN ENGLAND, GERMANY, AUSTRIA, AND AMERICA.

ELECTRIC FITTINGS DYNAMOS MOTORS.

# WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,

WORTLEY FIRE-CLAY WORKS,

Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

## MACHINE-MADE GAS-RETORTS.

# GAS AND WATER PIPES

AND

## CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

# CLAY CROSS COMPANY,

## CHESTERFIELD.

| TRADE MARK. | TELEGRAMS: | LONDON OFFICE: |
|---|---|---|
| CXC | "JACKSON" | 12, BURWOOD PLACE, W. |
| | CLAY CROSS. | |

# GODDARD, MASSEY, & WARNER'S

IMPROVED

## Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES, APPLY TO

## GODDARD, MASSEY, & WARNER,

ENGINEERS,

NOTTINGHAM.

The Apparatus has been supplied to the following Firms—

BURT BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (Four Apparatus).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited, SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

And to the following Gas Companies and Corporations—

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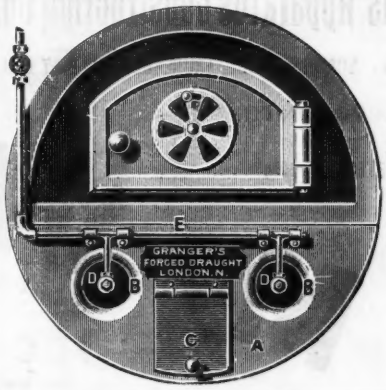


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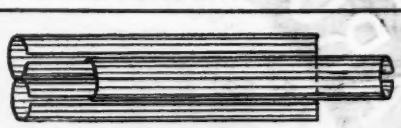

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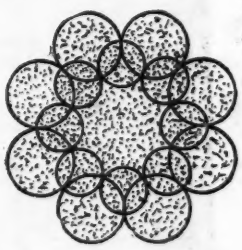

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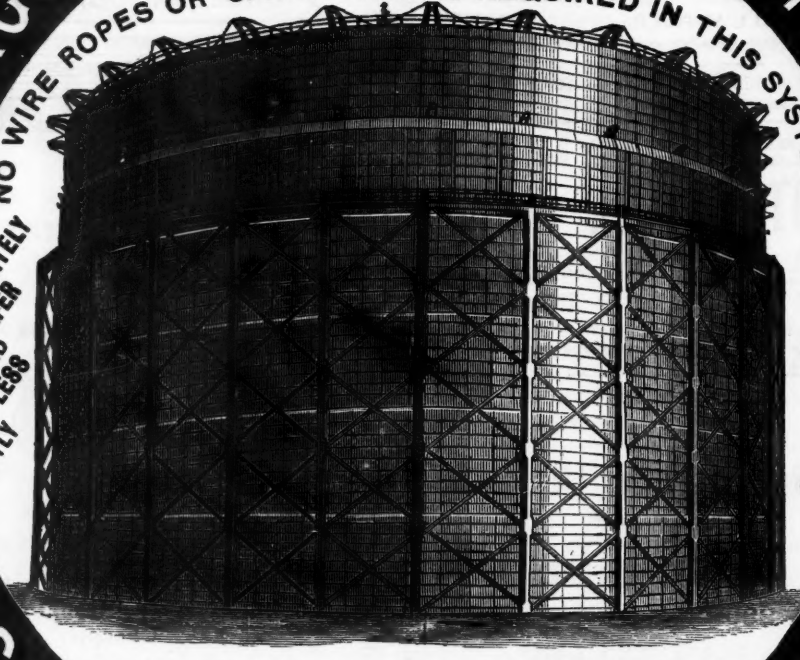

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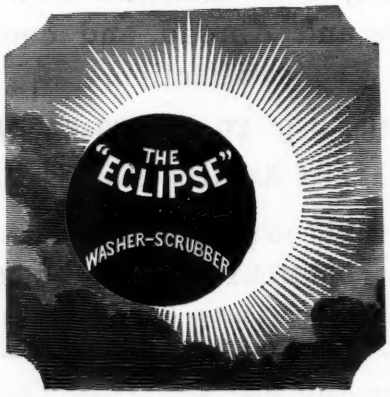


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